

General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

FOREIGN LICENSING -- U.S. GOVERNMENT AGENCIES
BY
FREDERICK J. LEES
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PRESENTED TO
INTERNATIONAL PATENT LICENSING CONFERENCE
OCTOBER 9, 1969

It is indeed a pleasure to participate in this International Patent Licensing Conference which is being conducted concurrently with the first annual PATEXPO. In keeping with the newness of this conference and exposition, I would start by mentioning some other firsts. The foreign patent program of the National Aeronautics and Space Administration, which I shall discuss in some detail with you this morning, is a relatively recent innovation within Government, and is perhaps the first attempt of a government agency to commercially exploit its patented technology in the overseas market place. And, as a direct result of this program, the first exclusive license under a government-owned foreign patent was executed earlier this year. This was a true original from two viewpoints -- the grant of exclusive manufacturing rights in a United States government-owned patent to a foreign corporation, and the receipt of income by the Government in consideration for

the grant of patent license rights. Before passing, and to give proper and deserved credit, the Atomic Energy Commission was the first government agency to establish an organized foreign patent program some years ago, and was of great assistance to NASA in initiating its program. I understand that a discussion of the unique licensing program of the AEC and its applicability to private industry is scheduled for tomorrow morning's conference session.

In accepting a speaking engagement of this type to address representatives of the private sector concerning the involvement of federal agencies in international patent licensing, I must confess that I approached it with some apprehension. However, I do believe that the Government, and especially NASA, has a timely contribution to make to the overall foreign patent picture and, accordingly, I will speak to you on this topic not from the viewpoint of an old-line, experienced government agency, but rather, from the viewpoint of a still youthful, innovative agency. I will explain some of the problems uncovered in establishing a new program, what we have learned through our brief experience, and the worthwhile goals which we expect to accomplish. While the title

of my topic, as you can observe from the program, broadly includes all government agencies, my comments will be generally restricted to the NASA program since, as I have indicated, the Atomic Energy Commission and NASA are the only two agencies presently active in the foreign patent area, and the AEC program will be covered on tomorrow's agenda.

The NASA foreign patent program is quite similar in purpose and design to a program which would be established by a corporation or business in private industry. The problems are comparable in securing adequate patent protection on selected valuable inventions in elected foreign countries, in attracting prospective licensees, in the negotiation of the license agreement, and in the administration and enforcement of a valid patent license beneficial to both parties. The foreign patent licensing field is one which presents a challenge to the organization and to the individual, whether he be legal counsel, technical representative, or a sales or marketing specialist, each of whom is essential to the team effort involved. A key member usually missing from the government team is the marketing specialist or the old-fashioned

traveling salesman, and this, at times, is an insurmountable barrier, as I will discuss later.

Initially, the question may be legitimately asked as to why a government agency would initiate a foreign patent program. What is the proper role of an agency in exploiting government-owned inventions and patents? In answer, I would state positively that the intention of the foreign patent program is not to compete with private industry. In fact, as far as NASA is concerned, we are normally desirous of deferring to our many contractors when they indicate their desire to file foreign patent applications and to exploit the foreign rights on inventions which are made and reported under contract. We consider the allocation of rights in inventions in the foreign area quite differently from the allocation of domestic rights in inventions, which is a separate subject in its own right and which is continually debated and studied. As many of you are aware, the existing cornerstone of federal patent policy is the Presidential Memorandum and Statement on Government Patent Policy issued by President Kennedy on October 10, 1963.

The premise on which our foreign patent program is based is that potentially valuable inventions, valuable both to the Government and to industry, reside within the approximately 20,000 invention disclosures and approximately 2,000 patents or patent applications comprising the ever-widening NASA portfolio -- and that such inventions, constituting a valuable national asset, will continue to lie dormant and unexploited, in the world market place without an organized effort or program to acquire and utilize foreign patent rights.

In establishing a program of this type, it is essential to set initial objectives or goals. Further, to succeed in creating a meaningful and effective program, the established objectives must be recognized and accepted by the company or agency entity as part of its overall mission. A foreign patent program cannot exist without active support of management and other officials, outside of the patent department.

The objectives of such a program in private industry may be briefly summarized. There are fundamentally four: First, exclusive protection -- foreign patents are obtained to afford a high degree of protection for the company's business. This enables it to maintain exclusive lines of

products and services in countries where the company does or expects to do business.

The second objective is defensive -- to assure freedom of action to the maximum practical extent. The aim is to keep the company free to use its own best engineering developments and to trade patent rights for essential licenses needed from others.

Third, licensing for income -- companies may obtain patents in order to establish a patent portfolio useful in licensing other companies and thus provide royalty income. This policy is more frequently used for countries where the company does not have a business.

And, fourth, licensing with know-how. Sometimes a company will obtain patents to support a policy of helping other companies to establish businesses based on the know-how it has developed. The management of such a company may wish to limit itself to research and development of inventions and to the technical know-how to utilize such inventions in a commercial business, without engaging in the business itself. These mentioned objectives are set forth and elaborated upon in an article by John R. Shipman entitled "International Patent

Planning" in the Harvard Business Review of April 1967. I recommend this article to your attention.

In describing the objectives of the NASA program in terms of the above four fundamental objectives, I believe we most closely fall under the latter two. The first two, exclusivity and defensive protection, are ruled out by the character of the government agency. Like educational and non-profit institutions, sometimes referred to as the third sector, NASA does not make or sell the products and processes embodying their inventions for commercial purposes, and must license these inventions in order to exploit them. Licensing private concerns for royalty income under our foreign patents, and helping companies establish commercial markets based on the inventions and technical know-how that we have developed primarily for aerospace purposes, are our basic objectives.

In more formal terms, the objectives of the NASA program, briefly stated, are to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

Taking these one at a time, the first -- to further the interests of United States industry in foreign commerce -- is the objective that perhaps primarily concerns you for purposes of today's presentation. We would hope that the acquisition of foreign patent rights, followed up by an active licensing program, would enable you to introduce a new product in the foreign market place in the face of foreign competition, or, perhaps more realistically, would enable you to fit an analogous item into your existing commercial product line and thereby better your position in the market place. Should not private industry doing business in various regions throughout the world be interested in securing foreign license rights on NASA-developed inventions, which would fit in side by side with existing export market product lines?

I realize that I have stated our first objective is to further the interests of United States industry in foreign commerce. I would hasten to add that rights under our acquired foreign patents are available to either domestic or foreign concerns on a royalty-bearing basis or for other consideration. In fact, the first license that NASA granted was to a Japanese company, as I will discuss shortly. And, to be truthful, the

major interest in our program thus far has been expressed by foreign business concerns.

By our second objective, to enhance the economic interests of the United States, we have in mind a monetary return to the United States, which, even though minimal, would to some extent aid in the balance-of-payments situation, and which would make the program, if worthwhile, self-sustaining. In this regard, it has recently been stated that the total industry licensing income attributable to patent royalties and fees has resulted in more than a three-quarter billion dollar annual flow into the United States from abroad, which materially assists the overall economic objectives of the United States Government.

The initial impact upon you of the concept of paying patent royalties to the Government may be unfavorable and one of displeasure. However, it should be realized that the contemplated royalty payment would ultimately be derived from the foreign consumer and not the individual United States taxpayer or the licensee. The policy of licensing for income applies only to the foreign patent portfolio of NASA, and does not extend to its domestic licensing program.

The third stated objective is to advance the international relationships of the United States. We feel that there are inventions in our portfolio which could be utilized effectively in international programs, whether they be space-oriented, or whether they be programs such as those supported by the Agency for International Development or other government agencies. Perhaps, some of the NASA-generated new technology could find application in developing countries, and the incentives of the patent system could lead to its introduction.

In addition, NASA, under the provisions of its enabling statute, the National Aeronautics and Space Act of 1958, has been charged with the mission of providing for the widest practical and appropriate dissemination of information concerning its activities and the results thereof. The foreign patent program serves in fulfilling this dissemination of information mission through publication of patent disclosures abroad, while at the same time maintaining a proprietary stance on valuable inventive subject matter going abroad.

Now, the three points I have just covered are speculative in nature. No hard prediction can be made as to whether these benefits will, in fact, materialize, but it was our feeling

that the time had come to test these theories either on a government-wide basis or within NASA in the form of a limited, trial program. I might add that NASA has never been timid in advancing novel programs or fresh concepts which are believed to be in the public interest, as evidenced by our leading role in the continuing debate centered around federal patent policy, and by the widely heralded NASA technology utilization program.

In this regard, one of the problems in justifying or evaluating a foreign program of this type is its long-range aspect. Many of the measurable benefits will not be known or arrived at for perhaps eight to ten years -- the time it may take to build a valuable patent portfolio, and for new and advanced technology to find utilization in the foreign market place. A foreign patent program must be initiated with this time-frame in mind to survive the impatience of short-range management.

Since NASA initiated its foreign patent licensing program slightly over three years ago through publication of formal regulations, there have been at least two bills circulated within Government which would establish a government-wide foreign patent program, having similar objectives, under the

sponsorship of the Department of Commerce. Other proposals which have not reached the definitive stage have suggested a quasi-Government corporation, perhaps fashioned after the British National Research and Development Corporation, for implementing such a program. Published figures evidence the fact that the total patent licensing income of NRDC exceeded three million dollars during the last year; United States licensees alone paid two million dollars. Historically, government-wide foreign patent programs are nothing new. President Truman, in 1947, signed Executive Order 9865 establishing a government-wide foreign patent program which subsequently failed in the early fifties because of lack of funding, licensing authority and interest, and which has never been revitalized.

Turning now to the implementation and management of a foreign patent licensing program, it is readily apparent that an organized group effort, utilizing the combined management, business, legal and marketing skills of those involved, is required. Implementation of a foreign patent program broadly consists of the following steps: establishing criteria for determining which technological developments should be

considered for the foreign filing of patent applications, and in which foreign countries the applications should be filed; the acquisition of the services of authorized patent representatives in the selected foreign countries necessary to effect the filing, prosecution, and maintenance of the applications; the attraction of prospective licensees through publications and other channels; and finally, the negotiation, execution, administration, and enforcement of the ensuing license agreements, the end objects of the entire program.

Each agency or company must establish its own criteria for selecting inventions upon which to file, based upon such factors as financial resources, fields of technology engaged in, extent of R&D programs, marketing outlets, product potential, and so forth. For those with established product lines such as communications equipment, ball bearings, or electrical components, the selection process may not be too difficult; however, in the case of a government agency which has no such product line, the criteria must necessarily be quite broad. In many instances, the inventions selected for filing by NASA are one-shot developments with little background

or related technology on which to rely. However, over a period of time, we have found some limited product lines beginning to develop. For example, NASA has developed a family of silicate-based paints originally adapted for space-craft use, and a series of fire retardant foams and paints, as well as the numerous inventions which stand alone. Our defined categories for selecting inventions for foreign filing are:

- a. Inventions which may be utilized abroad in governmental programs of the United States -- a broad classification which, to some extent, overlaps and includes inventions covered in subsequent categories;
- b. Inventions which may be exploited abroad in the public interest by license to U.S. nationals or others, i.e., those inventions we feel have considerable commercial promise;
- c. Inventions which may be utilized in applications type satellite systems, such as the automatic read-out equipment associated with the meteorological satellites, or telemetry equipment employed

in ground stations tied in with communications
satellite systems;

- d. Inventions considered to be basic discoveries or of major significance in the art, even though their immediate utilization is not clear; and
- e. Inventions in a field which directly concerns the public health or welfare, such as novel food products, new medical instruments and drugs.

Where do we file? We have thus far limited our filing to eleven foreign countries, eight of which are members of the European Space Research Organization (ESRO) and which obviously have an interest in space technology common to ours, plus Japan, Australia and Canada. We have attempted to limit our filing to those countries having strong patent systems and wherein the technology which has been derived from our space research and development programs would have the best opportunity of being utilized. Of course, in private industry, similar considerations are applicable. In what countries would a particular product be saleable, in what countries would a particular product be too complex or too costly for the general public, in what countries will the company's patents be

respected, and in what countries does the company have sales representatives or business outlets? All of these factors, and more, must be considered.

In order to file patent applications in foreign countries, the applicant's attorney or agent must be familiar with the individual law of the particular country and also must be registered to practice before the national Patent Office, just as attorneys must be registered before the United States Patent Office. In order to obtain the services of these foreign patent practitioners, and at the same time receive assistance in initiating our program, we originally negotiated contracts with two United States law firms who maintain associates in each of the foreign countries in which we have expressed an interest. The reason for utilizing the services of these firms is the limited amount of expertise available in-house to NASA or to any government agency in the foreign patent area, as is the case with most private concerns except for the very largest. Foreign patent practice is a very specialized area of patent law and is not generally engaged in by individual patent practitioners. Through the assistance

of our retained firms and our own efforts, we are building up our own degree of in-house expertise in this area.

Moving on to the actual objective of the foreign patent program, the licensing of the patents acquired -- the first step is that of attracting potential licensees or, in other words, advertising the available product. We have had little trouble in bringing our inventions available for licensing to the attention of interested domestic and foreign concerns. We were quite surprised at the number of trade journals that would pick up and print abstracts of our inventions on a gratuitous basis, and the number of inquiries which these publications prompted. During the last two years, we have received several hundred inquiries from foreign concerns regarding our portfolio of inventions. We have also published a pamphlet, "Significant NASA Inventions Available For Foreign Licensing," having a brief abstract and figure of the inventions, together with a copy of the NASA licensing regulations, which we send to interested parties.

While on the subject of attracting prospective licensees, I should mention that, in anticipation of placing a display of NASA patented new technology in PATEXPO '69, we have, for

the first time, drawn together selected examples of NASA hardware available for licensing, and have fashioned them into an integrated exhibit structure for viewing. This was also a very worthwhile project internally since, too often, Headquarters personnel, managers and cognizant attorneys are removed from the hardware itself and lose the proper prospective in administering a licensing program of this type.

Attracting inquiries, however, is only the first step. The major gap is between the attracting of the prospective licensee and the execution of the actual license agreement. Of the several hundred inquiries I have mentioned, only a relatively few have been heard from again after having received amplified technical information on certain inventions. This is, in large measure, due to our lack of a sales force, or marketing representatives, following up and knocking on the doors of parties making initial inquiries. Being a government agency, our staffing obviously does not provide for marketing or sales representatives, and it is quite unlikely that it ever will. Accordingly, we are forced to run a relatively passive program, relying almost wholly on correspondence, and to a great extent hope that the prospective

licensee will return to our door. This is obviously not the optimum manner in which to run an effective program. I am sure that those of you attempting to promote a foreign licensing program with limited resources are encountering similar problems.

Once a licensee materializes and the time has come to negotiate and prepare the formal legal instrument, the attorney comes to the forefront. In the agreement that I shall speak of shortly, twenty-five different articles were included having to do with such things as the duration of the agreement, scope of rights granted, the initial payment to be made by the licensee, minimum royalties and statement of rates, who may enforce the patent, designation of currency, applicable law, and on and on. We also found that we quite easily could have employed many more articles than those that were included.

Being a government agency, it was also necessary to include several articles which, unless you have dealt with the Government previously, would be quite confusing to anyone, as, I am sure, it is to a foreign licensee. I refer to such articles as "Covenant Against Contingent Fees" and "Officials Not to Benefit" clauses required by United States procurement

statutes. Perhaps the major difficulty in formalizing the license agreement itself is the arms-length, long distance negotiation which, at least in the initial stages, is compounded by language differences. To attempt to negotiate a license by mail is quite a task. To sit down around a table or desk with representatives of both sides present makes negotiation infinitely easier.

We have learned that in a program of this type there are many problems. It is not inexpensive to acquire foreign patents and the costs are continually rising. Perhaps the proposed and much discussed Patent Cooperation Treaty will help in this regard. Further, the administrative detail attributable to such a program is quite large. Very few organizations have the requisite skilled personnel to administer such a program in the same manner as their domestic programs. In addition, there is always a date-deadline factor in view of the time period set for response to official letters by the foreign patent offices and by the delays occasioned by language differences, the routing of papers through various individuals, and the distances involved.

While mentioning the fact that the time factor is of significance in a foreign patent program, it should also be brought out that the majority of the foreign patent laws differ from the United States patent law in at least one very major respect. Under the U.S. law, an applicant for letters patent is allowed a one-year period of grace subsequent to publication of his invention disclosure in a trade journal, magazine, or other printed publication to get his application on file in the U.S. Patent Office. However, under the majority of foreign patent laws, this same applicant is barred from obtaining a patent on his invention simultaneously with the date of the initial publication, unless the applicant has previously filed his patent application in one of the so-called "convention" countries. Obviously, with our widespread dissemination activities, such as the NASA Tech Brief Series and the STAR, "Scientific and Technical Aerospace Reports," we must win the race with them in the initial filing of patent applications in order to maintain our foreign patent rights on valuable inventions.

Perhaps the leading substantive problem, for a government agency at least, is that of enforceability of the patent and

the granting of a meaningful exclusivity to a licensee. It seems clear that it would require a very rare and unusual set of circumstances before the United States Government would elect to subject itself to the jurisdiction of a foreign court so as to sue infringers or to invoke its legal remedies under a patent. To partially offset this, we propose to authorize an exclusive licensee to enforce the patent at his own expense, and the license will so provide. I realize that there are probably as many different legal issues involved as to who may sue as there are national patent systems. However, I would hasten to add that, hopefully, in most cases, litigation would not be a prerequisite to recognition of our patents, just as it is often not required in the case of privately owned patents. We would rather rely on the technical information which we may contribute as a back-up package to our licensee, on possible trade-offs of rights in patented inventions or technical information, and on the ethical standards of the industry concerned.

Looking briefly at the first foreign license granted by NASA, the patented invention pertained to the interconnection of solar cells. The U.S. patent application was filed in

February of 1964 and recently issued in August of this year. The counterpart foreign applications were filed in January of 1965, within the one-year convention priority period. The licensee, Nippon Electric Company, Ltd., of Japan, originally learned of this invention through the list of abstracts which we have mailed out to many trade journals and to various industrial concerns throughout the world. The initial inquiry was received in April of 1967. Fortunately, the company retains an extremely capable attorney here in New York City to represent them, and after several drafts and a final meeting, the license was executed and made effective upon validation by the Japanese Government in January 1969, approximately 21 months after the initial inquiry. Sixty days prior to the license grant, notice was promulgated in the Federal Register providing interested parties an opportunity to comment or object. No adverse comments were received.

The license grants to Nippon the sole and exclusive right and license throughout Japan to manufacture the invention covered by the claims of the patent. In consideration therefor, the licensee has made a substantial down-payment and has agreed to a fixed royalty based on the fair market

value of all units used or sold throughout the agreement, which expires in 1981, unless sooner terminated. Nippon has also been granted the sole right to enforce the patent throughout Japan, and to institute litigation to restrain infringement, if necessary, at its own expense.

In conclusion, I would state that the foreign patent area is one of great challenge and of tremendous potential, both to private industry and to government agencies. The prospective monetary return to the company, the favorable effect on the balance-of-payments scale in a broad economic sense, and the opportunity for export expansion, all make this a potentially fruitful area. However, to reiterate, to be successful, a foreign patent program must be carefully organized with established objectives. The program must fit into the policy framework of the corporation or agency, and must have its recognized place; for, without adequate resources and proper direction, such a program can be quite costly, ineffective and wasteful. I will close by emphasizing the fact that the NASA program that I have been discussing must rely on the active participation of industry to be successful.

-25-

in obtaining its stated objectives, and that we heartily solicit your interest and comments.

Thank you.

SIGNIFICANT NASA INVENTIONS

**Available for Licensing
in Foreign Countries**

National Aeronautics and Space Administration

NASA FOREIGN PATENT LICENSING PROGRAM

The foreign licensing program of the National Aeronautics and Space Administration serves to promote and utilize foreign patent rights vested in the Administration. The objective of this program is to extend the patent coverage on valuable NASA-owned inventions to various foreign countries in order to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

Licenses will be individually negotiated and may be granted to any applicant, foreign or domestic, on a nonexclusive or exclusive basis for royalties or other considerations and on such other terms and conditions as are deemed appropriate to the interests of the United States. Preference in the granting of foreign license rights will be shown to those applicants who have previously been granted a license under the corresponding U.S. patent or patent application. The NASA Foreign Patent Licensing Regulations, 14 C.F.R. 1245.400 et seq., are reproduced on the following page.

This publication includes abstracts of those inventions in which NASA owns the principal or exclusive rights and which are presently available for patent licensing in the countries indicated. All inquiries, requests for additional information, and applications for license should be addressed to:

Assistant General Counsel for Patent Matters
National Aeronautics and Space Administration
Washington, D.C. 20546

Title 14—AERONAUTICS AND SPACE

Chapter V—National Aeronautics and Space Administration

PART 1245—PATENTS

Subpart 4—Foreign Patent Licensing Regulations

New Subpart 4 is added:

Subpart 4—Foreign Patent Licensing Regulations

Sec.

1245.400 Scope of subpart.

1245.401 Policy.

1245.402 Types of licenses and terms and conditions.

1245.403 Government license.

1245.404 Enforcement of patent rights.

1245.405 Procedures.

AUTHORITY: The provisions of this Subpart 4 issued under 42 U.S.C. 2457 (g) and (h).

§ 1245.400 Scope of subpart.

(a) The subpart establishes the policy, terms, conditions, and procedures under which NASA-owned foreign patents and patent applications may be licensed.

(b) The provisions of this subpart apply to all NASA-owned patents granted in countries other than the United States and to NASA-owned patent applications pending in such countries and supplement the provisions of Subpart 2 of this part for foreign patent licensing.

§ 1245.401 Policy.

The foreign licensing program of the National Aeronautics and Space Administration serves to promote and utilize foreign patent rights vested in the Administration. The objectives of this program are to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

§ 1245.402 Types of licenses and terms and conditions.

Licenses will be individually negotiated and may be granted to any applicant, foreign or domestic, on a nonexclusive or exclusive basis for royalties or other considerations and on such other terms and conditions as are deemed appropriate to the interests of the United States. Preference in the granting of foreign license rights will be shown to those applicants who have previously been granted a license under the corresponding U.S. patent or patent application.

§ 1245.403 Government license.

There will be reserved from each exclusive license an irrevocable, nonexclusive, nontransferable, royalty-free license for the practice of such invention throughout the world by or on behalf of the United States or any foreign government pursuant to any existing or future treaty or agreement with the United States.

§ 1245.404 Enforcement of patent rights.

An exclusive licensee will be authorized to enforce the licensed patent and to sue infringers of the patent at its own expense.

§ 1245.405 Procedures.

(a) NASA will publish in the United States, and elsewhere as may be appropriate, lists of NASA-owned foreign patents or patent applications available for licensing.

(b) NASA will also furnish written notice of the availability for licensing of NASA-owned foreign patents or patent applications to any licensee under the corresponding U.S. patent or patent application.

(c) Applications for license should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, D.C. 20456. The application must fully identify the patent or patent application, and state the type of license requested together with proposed terms and conditions thereof.

(d) The conduct of negotiations with prospective licensees will be the responsibility of the General Counsel, NASA. In the conduct of such negotiations, due regard shall be had for the possible interests of NASA program and staff offices, and their coordination will be obtained as deemed appropriate.

(e) NASA will publish notice in the **FEDERAL REGISTER**, and elsewhere as may be appropriate, of its intention to grant an exclusive license under an identified patent or patent application. An exclusive license will not be granted until the expiration of 60 days from the date of notice in order to provide a suitable time interval for interested persons or other Government agencies to interpose comment or objection.

(f) All licenses shall become effective upon the written acceptance by the licensee of a license instrument specifying the type of license and terms and conditions thereof.

Effective date. The provisions of this Subpart 4 are effective upon publication in the **FEDERAL REGISTER**.

JAMES E. WEBB,
Administrator.

[F.R. Doc. 66-8920; Filed, Aug. 17, 1966;
8:45 a.m.]

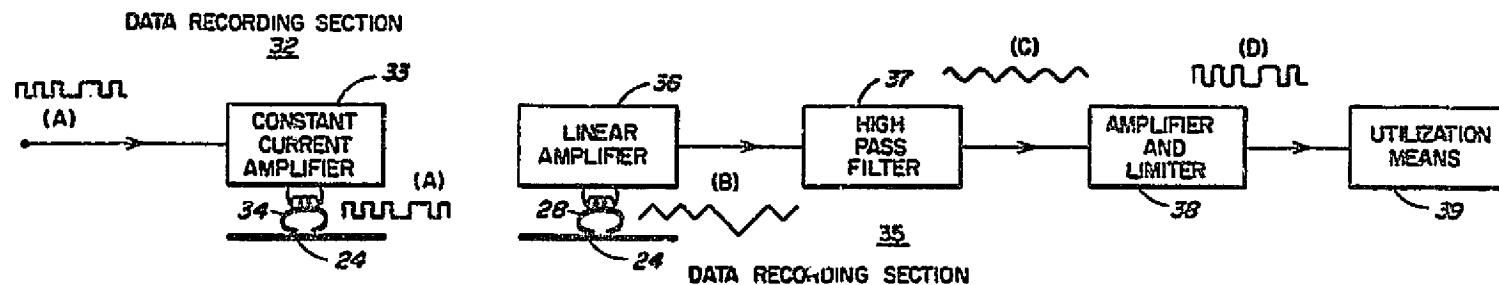
Listed below are abstracts of various NASA-owned inventions which are available for foreign licensing in the identified countries in accordance with the NASA Foreign Patent Licensing Regulations, published on August 18, 1966, in 31 Federal Register 10958-10959. Inquiries and all requests for licenses should be directed to Assistant General Counsel for Patent Matters, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546.

SYSTEM FOR RECORDING AND REPRODUCING PULSE CODE MODULATED DATA

In pulse code modulated magnetic tape recording and reproducing (playback) systems, the playback head tends to alter the shape of the recorded signal. Accordingly, the reproducing system must reconstruct the proper signal from the altered one. This invention eliminates the need for this reconstruction function by the design of the playback head in which the head gap is

approximately one-half the wave length of the recorded pulse code modulated data at its fundamental pulse repetition frequency. The playback head thus provides an output signal which is an integral of the recorded signal and contains all of the recorded information. The invention also allows a higher packing density of the recorded information on the magnetic tape.

XGS-1021 Belgium, Canada, France, Sweden, United Kingdom, West Germany

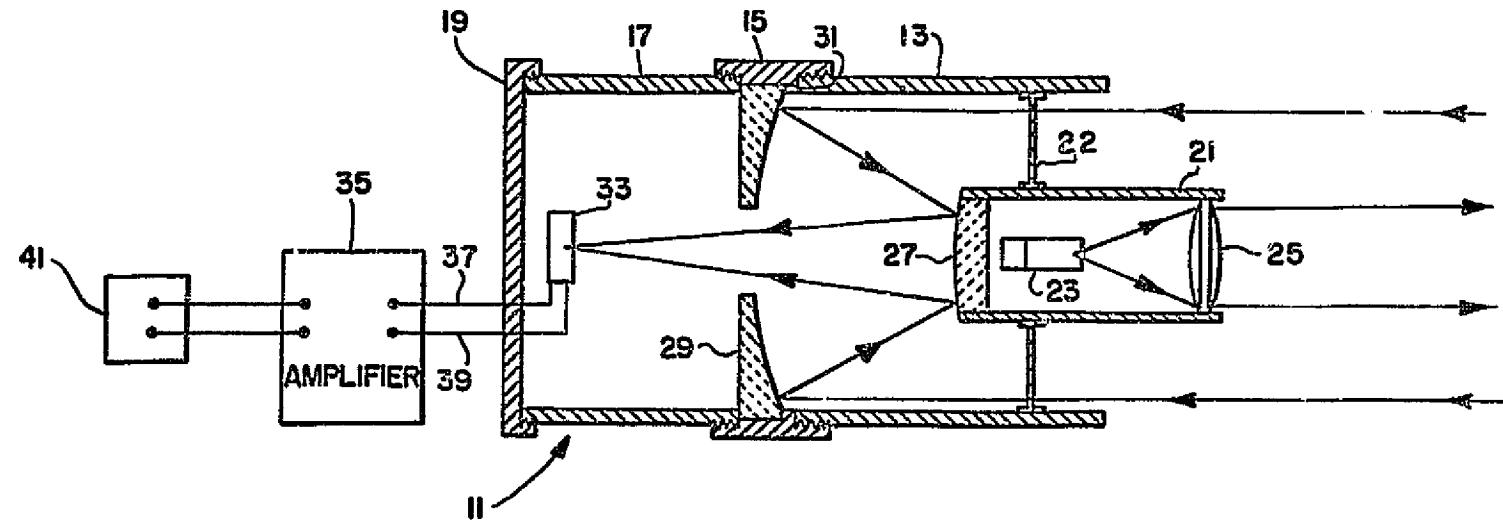


OPTICAL COMMUNICATIONS DEVICE

This is a light beam communication system in which energy from sound waves created by speaking in close proximity to a passive modulator, a modified corner reflector, modulates a remotely projected light beam and returns the modulated light beam parallel to the incom-

ing beam back to the source. The light beam modulation is decoded and amplified to produce a signal which can be used to drive a speaker, or the intelligence may be stored for future use.

XLA-1090 Belgium, Canada, France, Sweden, United Kingdom, West Germany

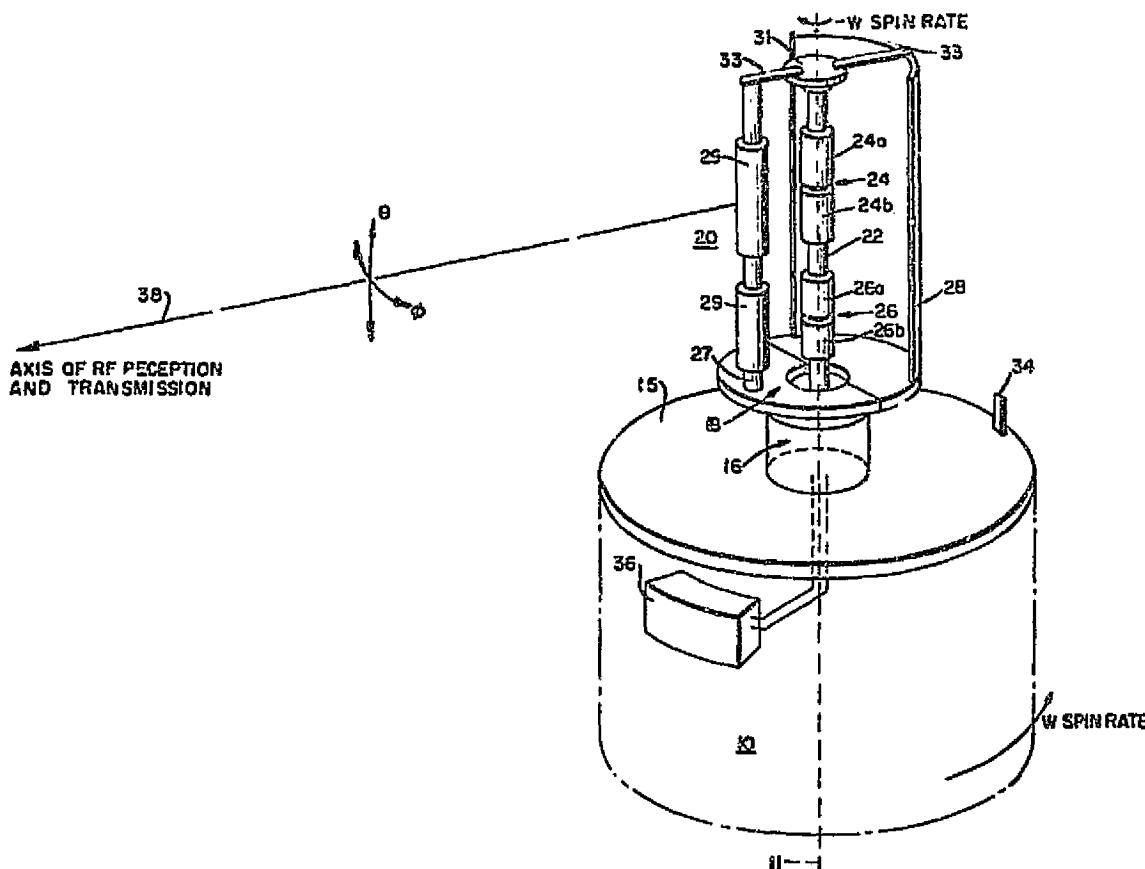


APPARATUS PROVIDING A DIRECTIVE FIELD PATTERN AND ATTITUDE SENSING OF A SPIN-STABILIZED SATELLITE

A satellite, adapted to spin about an axis, having antenna elements for communicating with a remote body and a beam collimator rotatable with respect to the spin axis. The beam collimator is rotated at the same rate and in the opposite direction as the spin of the satellite to provide a directional beam stationary in space. Ejection

apparatus enables the collimator to be jettisoned in event of rotational malfunction so that an omnidirectional beam may be provided about the spin axis. Signal processing circuitry operating in conjunction with the antenna elements provides information concerning the attitude of the satellite.

XGS-2607 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FOAMED IN-PLACE CERAMIC REFRactory INSULATING MATERIAL

In many applications there is a need for providing vibration shielding and also thermal protection for electrical components. Most prior potting compositions, while providing mechanical vibration protection, do not exhibit satisfactory thermal characteristics. On the other hand, some prior art refractory materials are known to have excellent thermal properties; however, electrical components cannot be potted directly in them because the extremely high temperatures required in the curing

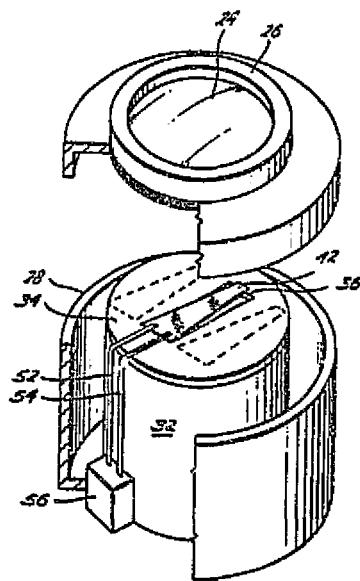
portion of the potting process would damage or destroy the components. In such cases it was necessary to prepare refractory blocks of various shapes which were then fitted around the objects to be protected. The obvious disadvantages of this procedure are obviated by this invention which may be foamed in-place since its curing time and temperature are relatively low. The invention has other uses such as in furnaces and in the construction industry as a low-cost, easily workable insulating material.

XGS-2435 Canada

LIGHT DETECTION SYSTEM

A system for determining the position of a light source about two axes of a reference position. The system, originally developed for orienting antenna on the Mariner spacecraft, utilizes a single movable part, a vibrating reed shutter, for alternately blocking and passing light from the source projected onto a photosensitive detector at the position of reference.

XMS-1059 Australia, Belgium, Canada, France, Italy, Japan, United Kingdom, West Germany



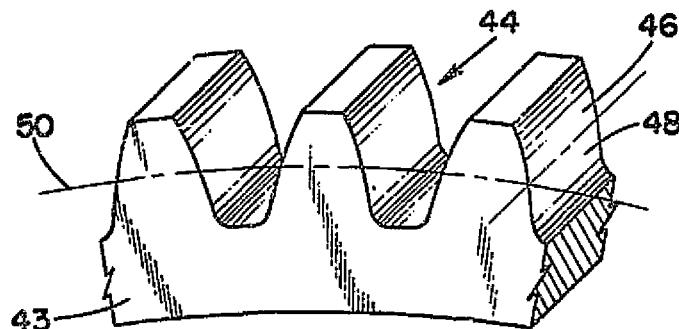
INSTRUMENT FOR USE IN PERFORMING A CONTROLLED VALSALVA MANEUVER

One of the clinical tests in the evaluation of the cardiovascular system of a human being is the Flack test which requires the imposition of a known constant pressure (greater than atmospheric) within the lungs and thorax and then a sudden release of the overpressure. The changes in the pulse rate and blood pressure of the subject associated with this maneuver (called a Valsalva Maneuver) are used in the Flack test as indicators for evaluating the cardiac control mechanism. Known de-

METHOD OF IMPROVING THE RELIABILITY OF A ROLLING ELEMENT SYSTEM

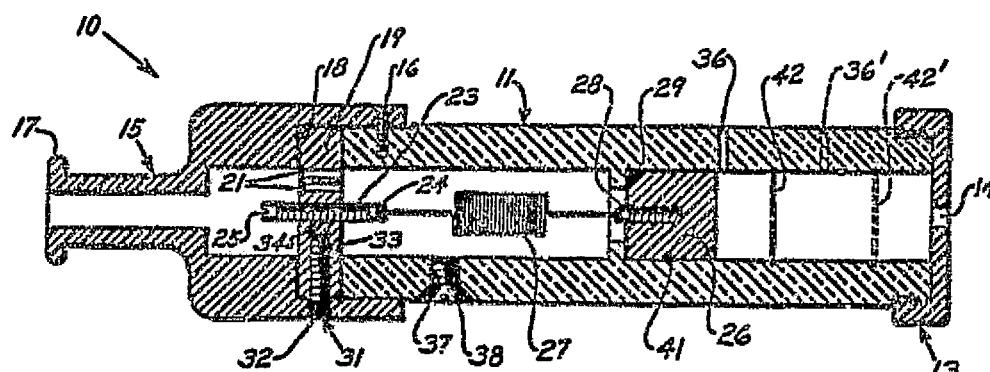
Current bearing manufacturing practice generally specifies that bearings shall have balls or rollers of hardness equal to the hardness of the races. This invention method greatly improves the load capacity and fatigue life of roller element systems by controlling the relative hardnesses such that the hardness of the elements subjected to the greater number of stress cycles is less than that of the elements engaging them by an amount between one and two points as measured on the "Rockwell C" Scale.

XLE-2999 Belgium, Canada, France, Japan, Sweden, United Kingdom, West Germany



vices for performing this maneuver have the disadvantages of requiring a gravitational field for proper readings of a manometer, large size, and fragile construction. There also is a possibility that the subject will use cheek muscles rather than the thoracic muscles, rendering incorrect results. This invention is rugged and compact, requires use of the thoracic muscles, and is not dependent upon the presence of a gravitational field for operation.

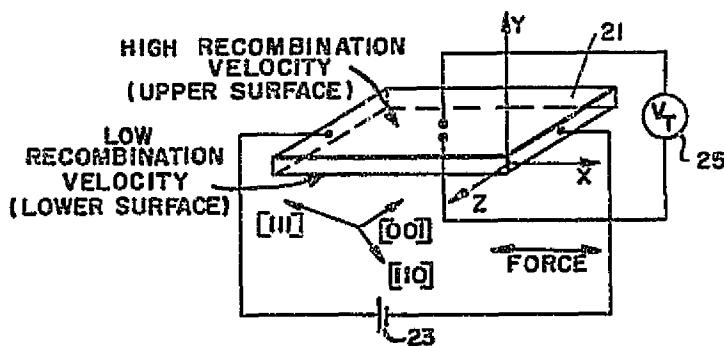
XMS-1615 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



TRANSVERSE PIEZORESISTANCE AND PINCH EFFECT ELECTROMECHANICAL TRANSDUCERS

This invention is a replacement for strain gages and accelerometers. The device may be used in any environment where conventional piezoresistive or strain gage electromechanical transducers can be used. In addition to the foregoing uses, the device can be used in bioelectric sensing due to its small size. The transducer, of anisotropic piezoresistive material, includes a body of semiconductor material having a longitudinal force axis that is skewed with respect to the crystallographic orientation of the body. The material combines the pinch effect with the piezoresistive effect. The device produces a much larger electrical signal for a given stress than presently known in the prior art.

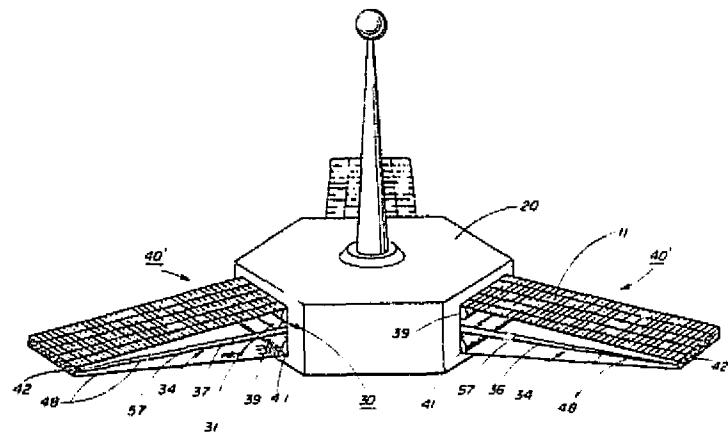
ERC-10088 Canada, France, Holland, Japan, United Kingdom, West Germany



INTERCONNECTION OF SOLAR CELLS

Expanded metal, that is, a thin metal strip which has first had short longitudinal cuts made therein and then been pulled transverse to the cuts to open the cuts into diamond shaped holes, has been used as interconnectors in a solar cell matrix to provide a flexible, somewhat resilient array. The solar cell array can be compactly stored prior to deployment and then deployed into a variety of shapes through the use of a new expandable frame in which telescoping tubes are extended to a desired length and then cemented to form a rigid support structure.

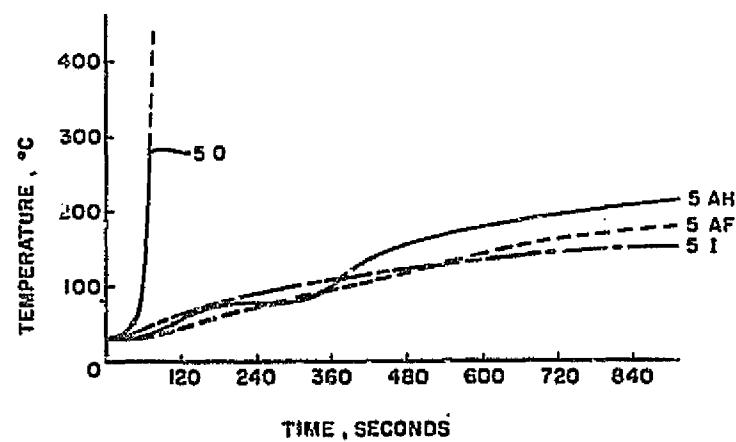
XGS-1475 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FIRE RETARDANT FOAMS

Modified foams have been developed which provide effective protection for thermally sensitive structures against the destructive action of fuel-fires. The invention relates to the modification of closed cell rigid and semi-rigid polyurethane foams in the density range of from 0.50 to 50 pounds per cubic foot. The modifying agents include three types: a certain class of alkyl halide resins, a certain class of inorganic salts, and encapsulated halogen bearing volatile molecules. The modified foam may then be applied by conventional methods. Outstanding protection against fire has been achieved.

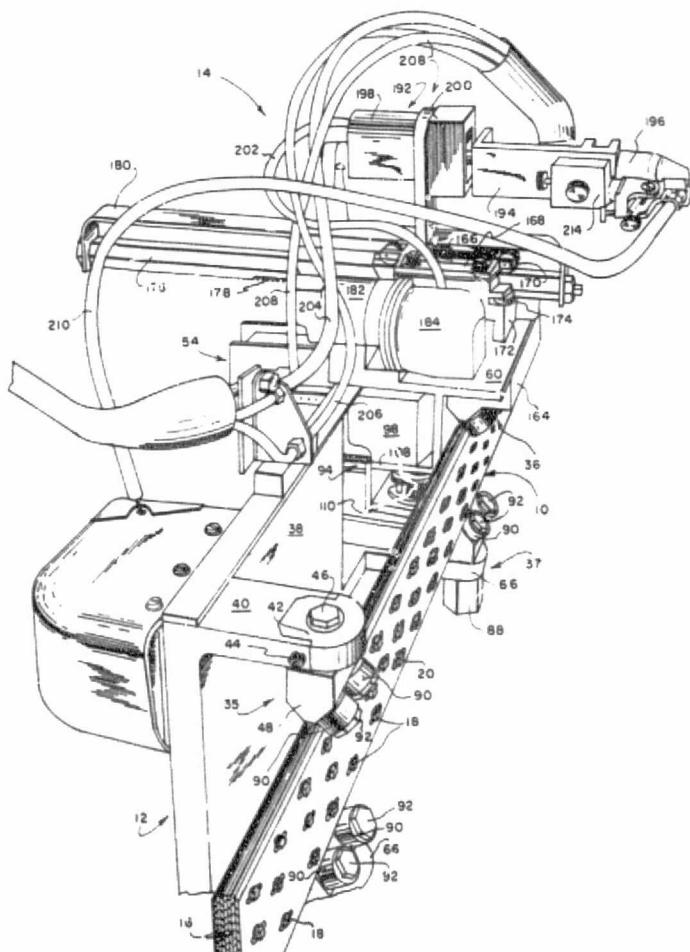
ARC-10098 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



WELDING SKATE AND TRACK

A track and skate combination is commonly used in the precision welding of relatively large articles such as tanks, ship hulls, etc. The track is contoured to the desired shape and placed alongside and parallel to the seam to be welded. This invention features a reusable track fabricated of a plurality of laminates that is easily bent into any desired shape and a skate having individually pivoted sets of wheels which can negotiate sharp curves on the track.

XMF-1542 Canada, France, Italy, Japan, United Kingdom, West Germany



POTASSIUM SILICATE-ZINC COATINGS

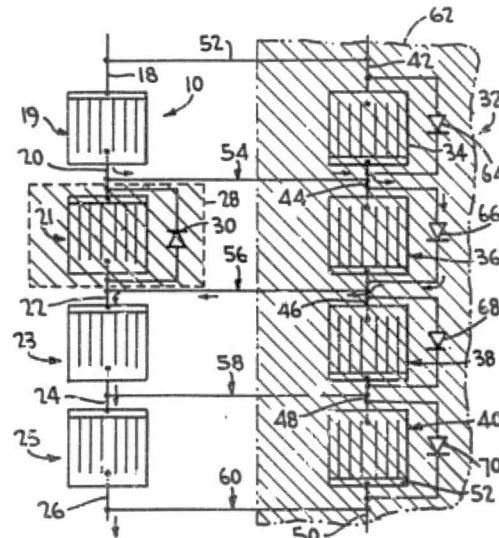
Zinc dust coatings which, when dried on a metal surface, are crack, craze, and abrasion resistant. The coatings are formed by combining a potassium silicate solution with zinc dust and, optionally, including an alkyl trialkoxysilane. These compositions of basically inorganic materials are intended primarily for the protection of metals subject to adverse environmental conditions.

GSC-10361 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany

USE OF UNILLUMINATED SOLAR CELLS AS SHUNT DIODES FOR A SOLAR ARRAY

An improvement has been made in the electrical interconnection of solar cells in an array of solar batteries. Each individual cell of a shaded battery is electrically connected in parallel with a corresponding cell of an illuminated solar battery. The p-n junction solar cell of the shaded battery provides a forward biased diode equivalent in a by-pass conducting path around the corresponding illuminated cell in the event it becomes non-conductive. Thus, uninterrupted current flow is maintained in the event the illuminated cell fails to function.

GSC-10344 Canada, France, Holland, Italy, Japan, United Kingdom, West Germany



INTUMESCENT PAINTS

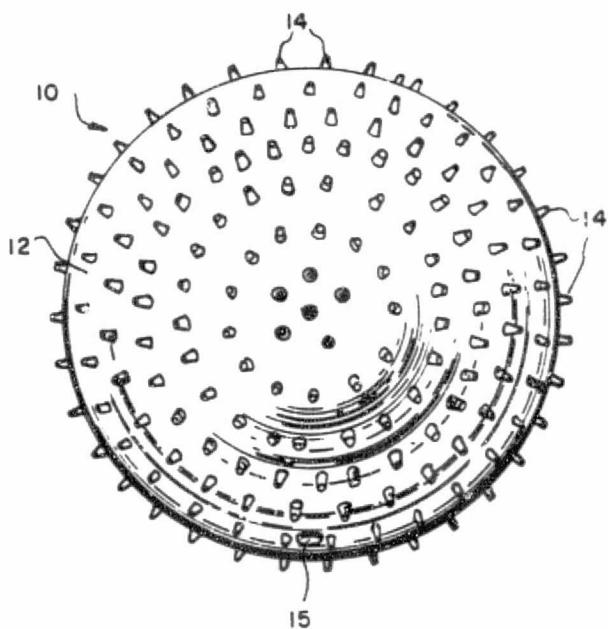
Intumescence (swelling or expanding) paints useful for fire protection have been produced. Conventional intumescence paints suffer from many disadvantages including sensitivity to water and other solvents, little resistance to scuffing and abrasion, sensitivity to thermal erosion by flames, and limited efficiency in the protection of substrates under thin steel plate or sheet. This paint overcomes these disadvantages and provides outstanding protection. The intumescence material is an aromatic nitroamino compound in the form of its sulfate, either dissolved or dispersed in a vehicle, or prepolymerized, or both. Upon heating, such a paint intumesces, chars and provides a flame resistant coating.

ARC-10099 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany

FLUID FLOW SENSOR

A meteorological balloon having superior response and aerodynamic stability characteristics due to provision of a plurality of evenly dispersed protuberances on the balloon surface. These protuberances form a roughened surface to provide a more evenly distributed flow separation area to induce a larger balloon wake, resulting in greater stability in flight.

XMF-4163 Canada



UNSATURATING SATURABLE CORE TRANSFORMER

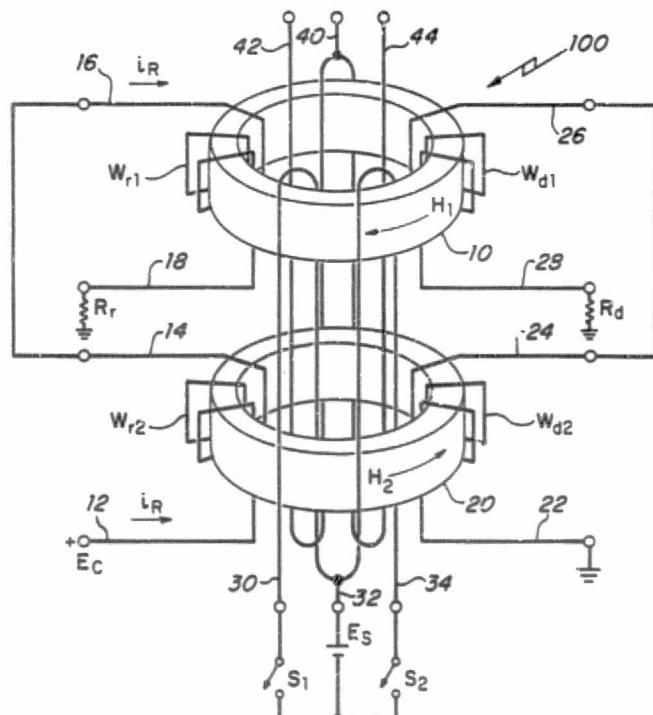
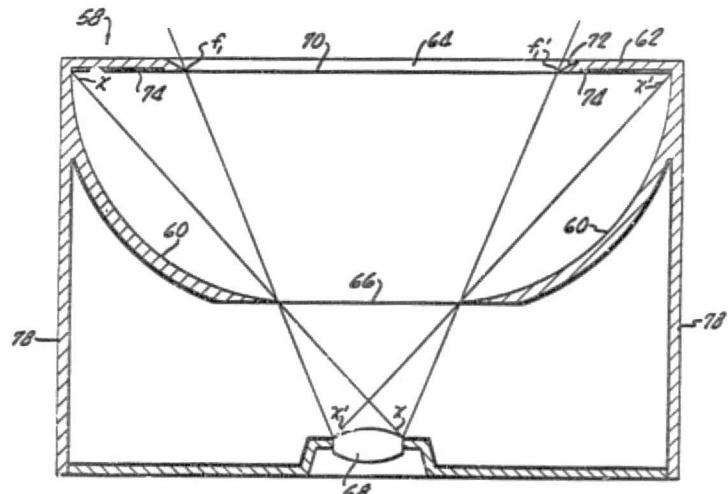
The transformer of the present invention will not saturate at any time under any conditions for any length of time. The device includes a pair of stacked, uncut, saturable magnetic cores having a plurality of windings. The cores operate in parallel and provide a means of detecting, warning and suppressing any impending saturation before saturation can occur. Many advantages are gained from the use of this transformer such as: elimination of the main apparent cause of power transistor failure in inverter circuits while enabling existing power transistors to process double or more load current, and, enabling a better utilization of existing components because it reduces the need to derate switching components to a small fraction of their current carrying capacity.

ERC-10125 Canada, France, Holland, Italy, Japan, United Kingdom, West Germany

ANTI-GLARE IMPROVEMENT FOR OPTICAL IMAGING SYSTEMS

This invention is directed to an anti-glare baffle for shading rays such as light rays or other radiant energy rays which emanate from outside a desired field of view. The device may find use in sensitive still and movie cameras, light meters, telescopes, radiometers, photometers, electro-optical position sensors, photocell shades, star tracking devices and the like. The anti-glare baffle has a specularly reflective surface formed from an oblate hemispheroid. A shading flange extends inwardly from the upper edge of the hemispheroid and intersects the foci of the oblate hemispheroid. The oblate hemispheroid and flange surround a viewing aperture and spaced ray detecting device.

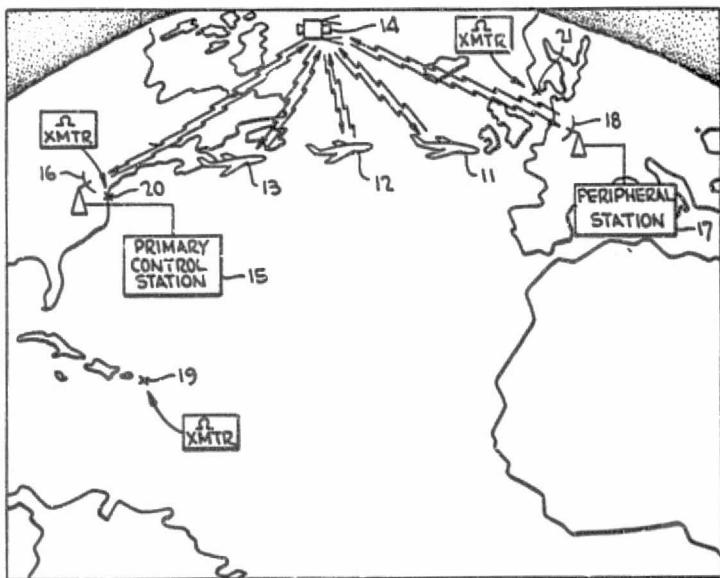
NPO-10337 Belgium, Canada, France, Great Britain, Italy, Japan, West Germany



POSITION LOCATION SYSTEM AND METHOD

System and method for position locating, deriving centralized air traffic control data, and communicating via voice and digital signals between a multiplicity of remote aircraft (including supersonic transports) and a central station, as well as a peripheral ground station(s), through a synchronous satellite relay station. Side tone ranging patterns, as well as digital and voice signals are modulated on a carrier transmitted from the central station and received on all of the supersonic transports. Each aircraft communicates with the ground stations via a different frequency multiplexed spectrum. Supersonic transport position is derived from a computer at the central station and supplied to a local air traffic controller. Position is determined in response to variable phase information imposed on the side tones at the aircraft, and relayed back to the transports. Common to all of the side tone techniques is Doppler compensation for the supersonic transport velocity.

GSC-10087-1 Australia, Belgium, Canada, France, Italy, Japan, Switzerland, United Kingdom, West Germany



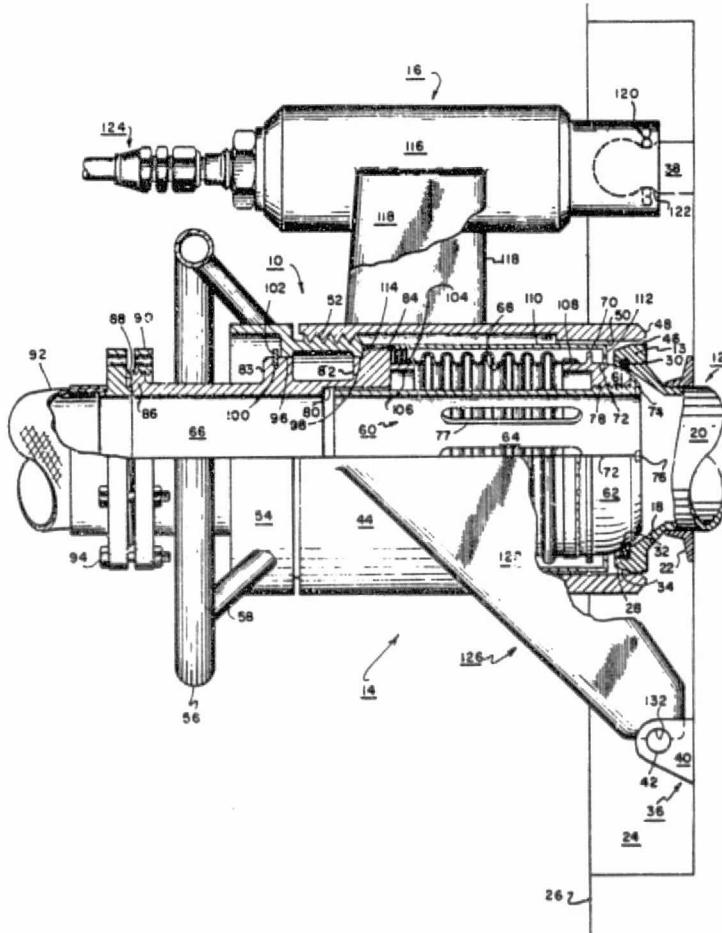
FIRE RESISTANT COATING COMPOSITION

Fire resistant coating compositions intended for high temperature applications, which when dried are flake, crack, craze, and abrasion resistant and of greatly reduced leachability. The compositions, which are combinable with selected conventional pigments and fillers,

FLUID COUPLING ASSEMBLY

A quick attach and release fluid coupling for use in those instances where it is desirable that the coupling not only be free from leaks, but also be both easily assembled together and separated. The mating conical and spherical sealing surfaces of this coupling serve to eliminate alignment problems. The coupling is ideally suited for use in cryogenic piping systems where icing conditions are encountered.

XKS-1985 Belgium, Canada, France, Italy, United Kingdom, West Germany



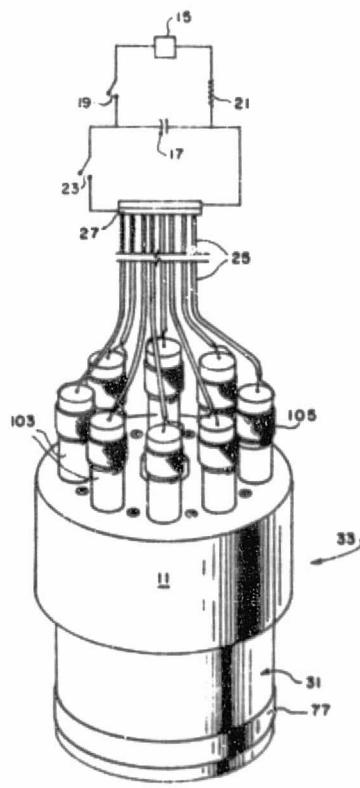
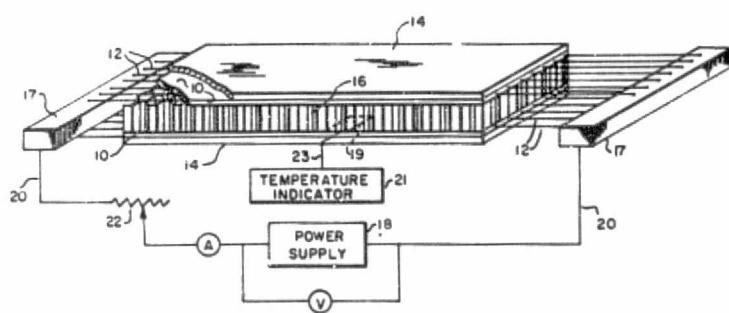
comprise a combination of a potassium silicate solution, ceric oxide, and/or alkyl trialkoxy silane as rehydration suppressants, and wollastonite as a film builder.

GSC-10072 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany

HEAT CURING OF THERMOSETTING PLASTIC FILM ADHESIVES

In order to manufacture strong lightweight metal panels for use in very large structures such as bulkheads in propellant tanks for spacecraft boosters or large aircraft, it is desirable to utilize a honeycomb structure. The difficulty experienced is in curing the thermosetting film which is used as the adhesive to bond the outer plates to the honeycomb core. It was impractical to place the panel in a curing oven since such an oven would have to be very large and it would not be satisfactory for other differently shaped panels. This invention provides curing of the thermosetting film by incorporating a heat producing means within the bonding material.

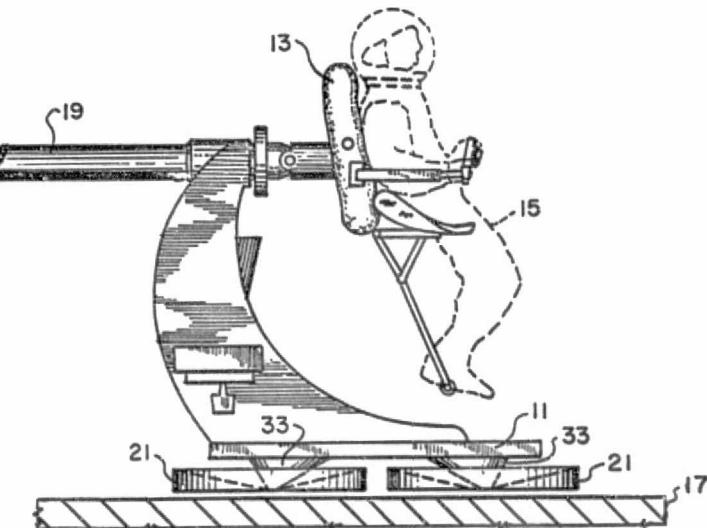
XMF-1402 France, Canada, Italy, United Kingdom, West Germany



AIR CUSHION LIFT PAD

An air cushion lift pad has been developed which utilizes an air cushion of pressurized air to support a device above a surface. The pad includes an upper wall which slopes upwardly from a center portion. Should the pad tend to tilt, the vertical lift force component acting on the inner wall will tend to decrease on the high side and increase on the low side, thereby producing a torque tending to stabilize the pad along the horizontal. A plurality of pads may be used and the design achieves a very stable device with no flutter, vibration, heaving or pitching.

MFS-14685 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



MAGNETOMOTIVE METAL WORKING DEVICE

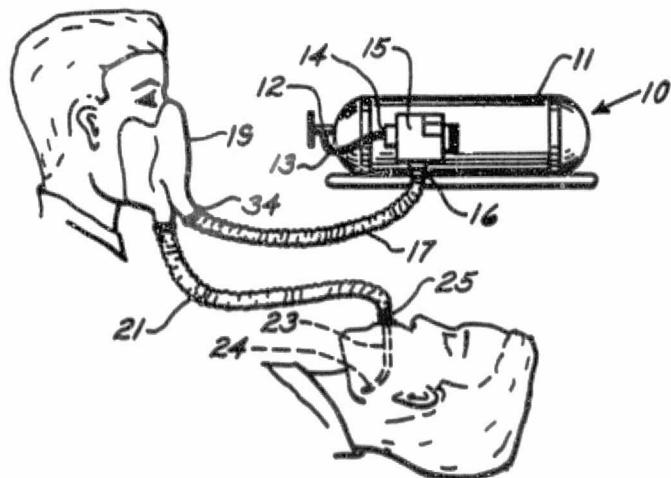
A portable magnetic hammer, a metal working device developed in the course of the Saturn program, wherein energy for manipulating a metal workpiece is acquired by creating a high-intensity magnetic field from a controlled electrical discharge into a conductor coil. This compact, lightweight device performs sizing, blanking, and stress removal functions without surface marring of the metals.

XMF-3793 Belgium, Canada, France, Holland, Italy, Japan, Sweden, United Kingdom, West Germany

RESUSCITATION METHOD AND APPARATUS

A more direct method has been developed to revive a person suffering from respiratory failure or arrest. By means of an airway or tube inserted into the throat, oxygen is delivered directly to the lungs of the patient. The increased intrapulmonic pressure induces ready assimilation of oxygen into the vascular system and employment of a tube or airway precludes pharyngeal blockage and the possibility of the subject's swallowing his tongue.

XMS-1115 Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



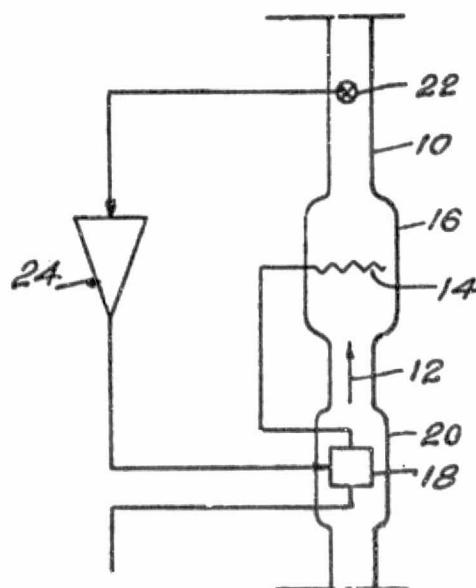
TIME DIVISION MULTIPLEX SYSTEM

Apparatus for synchronizing a satellite time division multiplex system so that signals can be transmitted or received between any of the stations. The system constantly compensates for Doppler shift so that a medium altitude satellite is always in synchronization.

APPARATUS FOR CONTROLLABLY HEATING FLUID

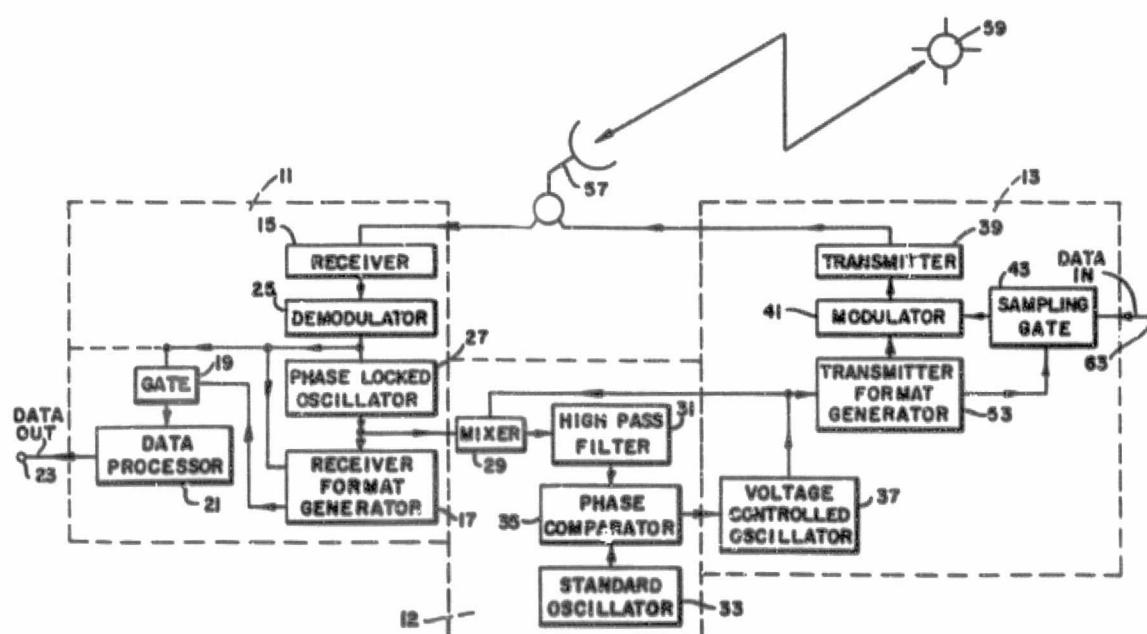
This invention is associated with fluid heating devices which operate by circulating fluid past an electronically controlled heater element in a flow conduit. The efficiency of such devices is increased by placing the heater control components in the conduit, upstream from the heater element, thereby utilizing the heat generated in the control components for preheating the fluid anterior to the principal heater element.

XMF-4237 Canada



Additionally, a system is provided for centering a slave station in an empty slot in the time division multiplex format.

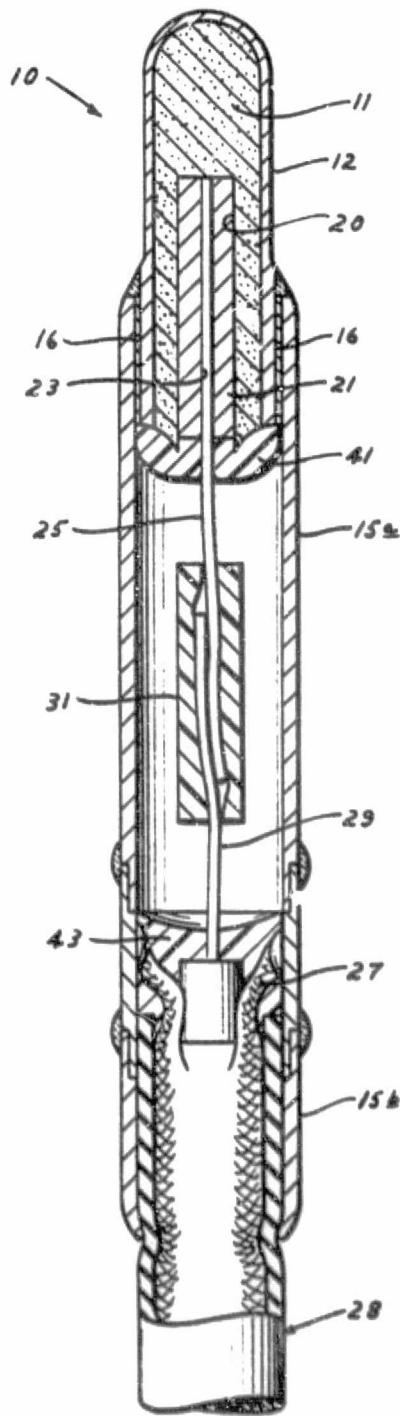
XGS-5918 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



MEDICAL DETECTING PROBE

A radiation detector in the form of a bullet has been developed for easy insertion into the human body tissue to indicate radiation damage to body cells or to measure dose levels of radioactive tracers. The detecting element is formed from a silicon crystal having a P-N type junction. When a reverse bias is applied, radiation penetrating the junction creates voltage pulses which are recorded.

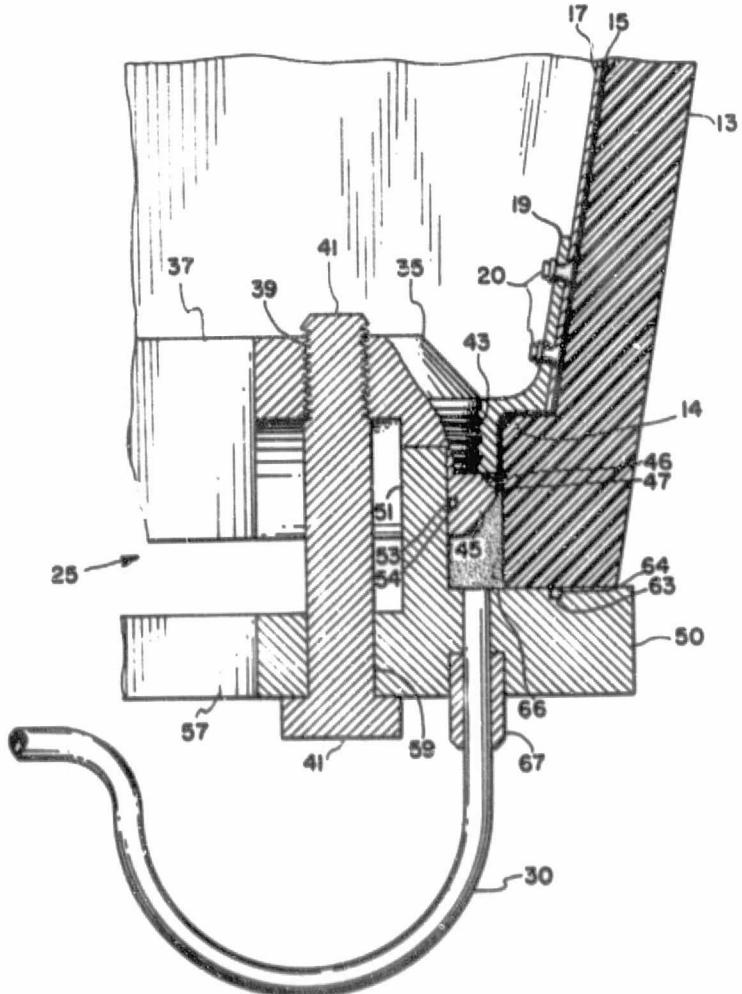
XMS-1177 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



BONDING PROCEDURE

The need for thermal protection of certain metal components from extreme temperatures, such as telemetry antennas on spacecraft during atmospheric re-entry, has led to the development of a new bonding procedure. The problems caused by the difference in the coefficients of thermal expansion of a protective layer such as a plastic lamination and the metal surface of the component and also the presence of entrained air or vapors in the bonding material have been met by this method of bonding polytetrafluoroethylene to a magnesium alloy surface using a suitable thermosetting epoxy adhesive.

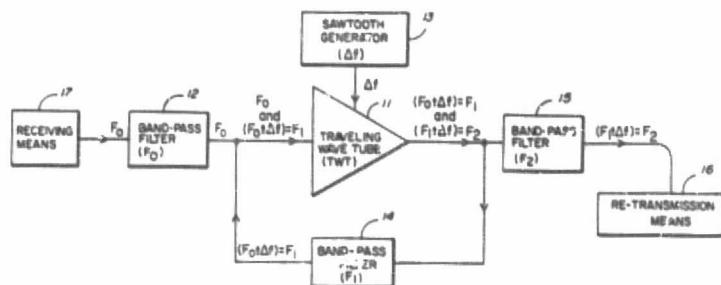
XLA-1262 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FREQUENCY CONVERTER RE-ENTRY AMPLIFIER

It is essential in many communications systems that microwave carrier frequency signals be amplified. This is generally accomplished by an active repeater which receives the signal, amplifies it, converts it to another microwave frequency and then re-transmits it. The frequency conversion prevents feedback which would cause spurious oscillations in the system. This invention utilizes a traveling wave tube to carry out the dual function of amplifying an input signal and also shifting its frequency. Thus a simple system of few components is used which requires less power for operation and accordingly has application in communications satellite systems.

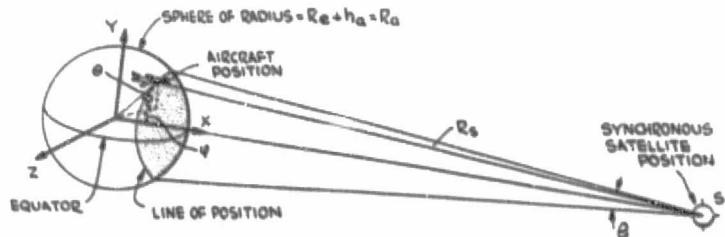
XGS-1022 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



TRAFFIC CONTROL SYSTEM AND METHOD

(Same as GSC 10087-1, appearing 4 pages earlier)

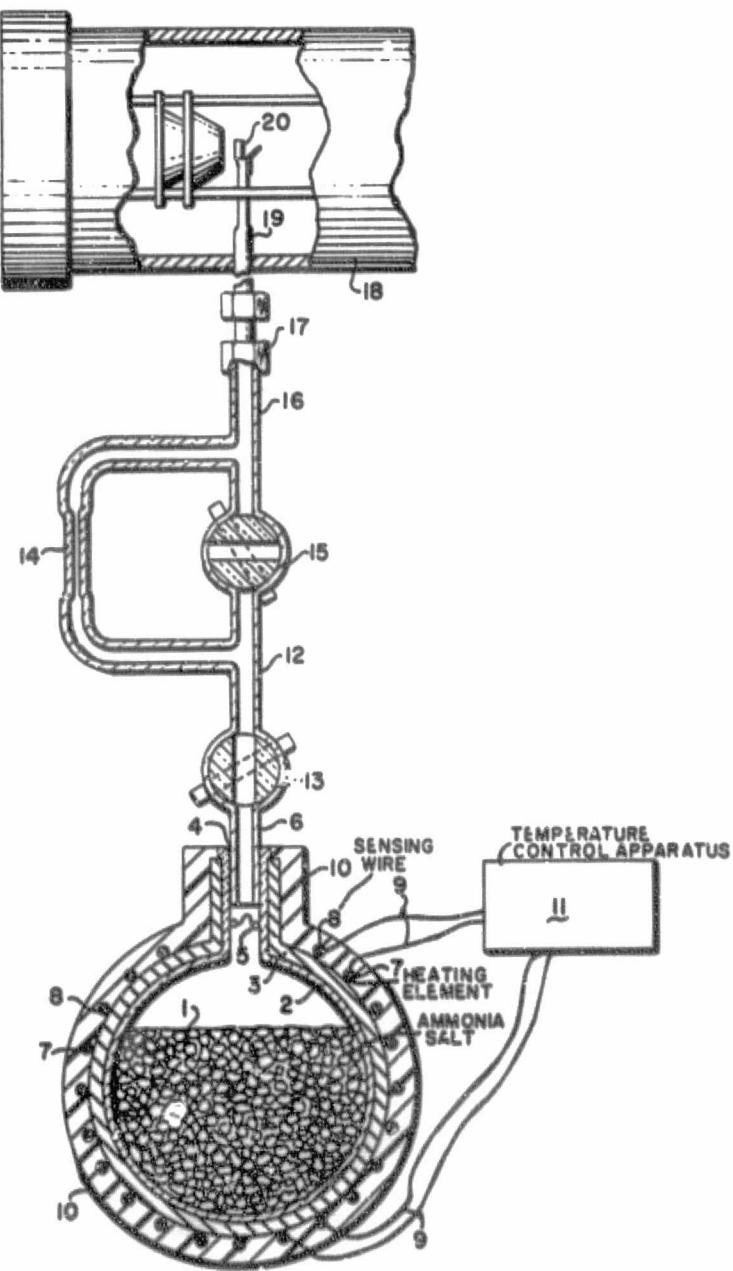
GSC-10087-2 Australia, Belgium, Canada, France, Italy, Japan, Switzerland, United Kingdom, West Germany



SOLID STATE CHEMICAL SOURCE FOR AMMONIA BEAM MASER

Ammonia gas beam-type masers have in the past used liquid ammonia sources. Due to the high vapor pressure of liquid ammonia (on the order of 9 atmospheres at room temperature), it has to be stored in heavy stainless steel cylinders equipped with elaborate pressure reducing valves. This invention comprises an apparatus for generating gaseous ammonia from a solid state source, thus eliminating the need for storing the ammonia in the liquid state.

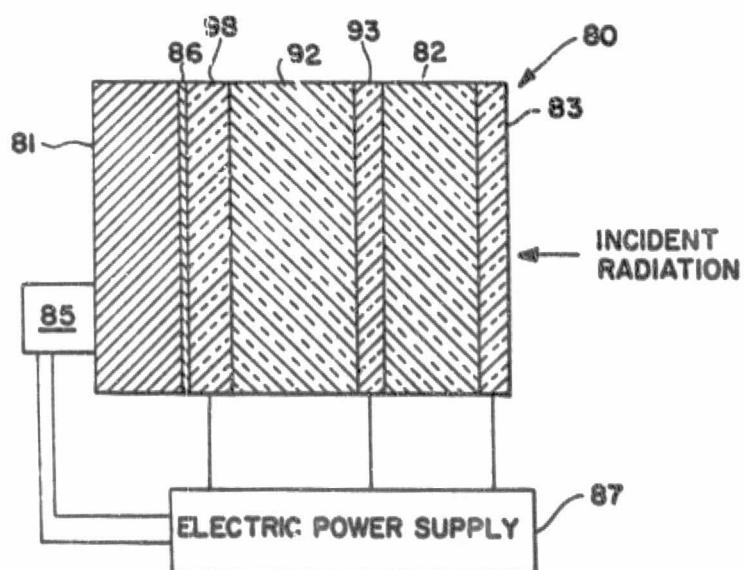
XGS-1504 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



THERMAL CONTROL PANEL

It is necessary to protect the interior of space vehicles from the extreme environmental temperature changes encountered in space missions. For this purpose a thermo-sensitive panel construction has been developed for achieving selectively changeable and controllable surface solar absorptivity/emissivity ratios. The result is obtained by altering the molecular structure of the panel construction through such changes as electroluminescence, semiconductivity, photovoltaic effect and electro-optical polarization.

XLA-7728 Belgium, Canada, France, Japan, United Kingdom, West Germany



ALKALI METAL SILICATE PROTECTIVE COATING

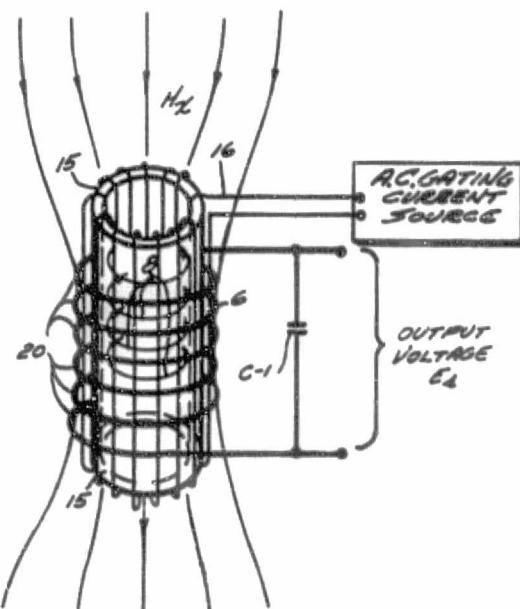
A series of completely inorganic paints, originally developed for satellite use, formulated with an alkali-metal silicate solution as a vehicle, a phosphate as a wetting agent, a pigment as a coloring agent and filler, and water as a thinner. These paints are nontoxic, durable, water insoluble, have excellent ultra-violet radiation resistance, and are highly adherent to various surfaces exposed to a wide range of temperatures.

XGS-4119, XGS-4799 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany

FLUX GATE MAGNETOMETER

A magnetometer of the flux gate type in which gating flux leakage is minimized and substantially completely decoupled from the ambient flux to be measured through unique geometry of magnetic material and flux gate design. The flux sensing device basically employs a tubular core having a toroidal gating coil wound thereon and a surrounding solenoidal signal output coil.

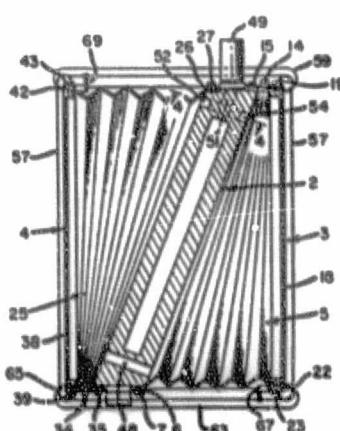
XGS-1881 Canada, United Kingdom



BALANCED BELLows SPIROMETER

A laboratory instrument for measuring total lung capacity, vital capacity, maximum breathing capacity, tidal volume, functional residual capacity and oxygen uptake of human subjects. The spirometer, which employs two mechanically interconnected bellows, is compact, retains calibration, and is unaffected by acceleration fields along all three coordinate axes.

XAC-1547 Canada, France, United Kingdom, West Germany



**U.S. PATENTS
FOR
NASA INVENTIONS**

**Available for Licensing
in the United States**

*** Many Have Commercial Use ***

National Aeronautics and Space Administration



NASA DOMESTIC PATENT LICENSING PROGRAM

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application.

The inventions having important use in Government programs or significant commercial potential are patented by NASA. In order to encourage the widest possible commercial use of these inventions, NASA makes its patents and applications for patent available for commercial licensing in accordance with the NASA Patent Licensing Regulations, Title 14 Code of Federal Regulations Section 1245.200 et seq.

NASA will grant nonexclusive, royalty-free licenses for inventions covered by patents and applications for patent for the term of the patent unless subsequently revoked or terminated by either party pursuant to agreed upon conditions. If commercial use of an invention has not occurred by the end of the second year after the issue date of the patent, an exclusive, royalty-free license may be granted by NASA to a qualified applicant thereby adding the incentive of exclusivity to encourage the commercial development of the invention.

ADDRESS

Inquiries and all applications for licenses should be addressed to:

Assistant General Counsel for Patent Matters
National Aeronautics and Space Administration
Washington, D.C. 20546

APPLICATION FOR LICENSE

An application for a patent license shall include:

1. Identification of invention for which license is desired:
 - Title of invention
 - U.S. Patent No. or Application No. (if known)
 - NASA Tech Brief No. (if applicable)
 - Other identification of invention (if any)
2. Name and address of company or organization applying for license
3. Name and address of representative or applicant to whom correspondence should be sent
4. Nature and type of applicant's business
5. Number of employees
6. Identification of source of information about the availability of a license on this invention
7. Purpose for which license is desired.

An application for exclusive license shall also include:

8. Applicant's status, if any, in any one or more of the following categories: (a) small business firms; (b) location in a surplus labor area; (c) location in a low income urban area; and (d) location in an area designated by the Government as economically depressed.

9. A description of applicant's capability to undertake the industrial marketing and development required to achieve the practical application of the invention.
10. The time and expenditure which the applicant estimates to be required to develop the invention to the point of practical application and the applicant's intention to invest that sum of money in development of the invention if the license is granted.
11. Whether the applicant would be willing to accept an exclusive license in a limited field of use or for any geographic portion less than the entirety of the United States of America, its territories and possessions, and if so, define the geographic portion or limited field.
12. Any other facts which the applicant believes to show it to be in the interests of the United States of America for the Administration to grant an exclusive license rather than a nonexclusive license and that such an exclusive license should be granted to the applicant.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

U.S. PATENTS AVAILABLE FOR LICENSING

Listed below are the U.S. patents available for royalty-free licensing from the National Aeronautics and Space Administration. Copies of the patents may be purchased directly from the U.S. Patent Office, Washington, D.C., for fifty cents a copy. Any NASA patent more than two years old and not in commercial use may be available for exclusive licensing. The patents marked with an asterisk (*) are believed to have good commercial potential use without much further development. Those marked with a double asterisk (**) have good potential, but may require further development for commercial use.

<u>Patent No.</u>	<u>Date</u>	<u>Title</u>	<u>Patent No.</u>	<u>Date</u>	<u>Title</u>
2,837,706	6-3-58	Line Following Servosystem	3,049,876	8-21-62	Annular Rocket Motor and Nozzle Configuration
2,898,889	8-11-59	Mechanically-Limited Electrically Operated Hydraulic Valve System for Aircraft Controls	3,053,484	9-11-62	Variable Sweep Wing Configuration
2,903,307	9-8-59	Two Component Bearing	3,057,597	10-9-62	Modification and Improvements to Cooled Blades
2,926,123	2-23-60	Temperature Reducing Coating for Metals Subject to Flame Exposure	3,059,220	10-16-62	Apparatus for Coupling a Plurality of Ungrounded Circuits to a Grounded Circuit
2,934,331	4-26-60	Apparatus for Making a Metal Slurry Product	3,063,291	11-13-62	High Vacuum Condenser Tank for Ion Rocket Engines
2,940,259	6-14-60	Rocket Propellant Injector	3,064,928	11-20-62	Variable Sweep Wing Aircraft
2,944,316	7-12-60	Process of Casting Heavy Slips	3,067,573	12-11-62	Telescoping-Spike Supersonic Inlet for Aircraft Engines
2,945,667	7-19-60	Flexible Seal for Valves	3,068,658	12-18-62	Venting Vapor Apparatus
2,956,772	10-18-60	Liquid-Spray Cooling Method	3,069,123	12-18-62	Instrument Support with Precise Lateral Adjustment
2,971,837	2-14-61	High Temperature Nickel-Base Alloy	3,070,330	12-25-62	Attitude and Propellant Flow Control System and Method
2,971,838	2-14-61	High Temperature Nickel-Base Alloy	3,070,349	12-25-62	Multistage Multiple-Reentry Turbine
2,974,925	3-14-61	External Liquid-Spray Cooling of Turbine Blades	3,070,407	12-25-62	Air Bearing
2,984,735	5-16-61	Runway Light	3,072,574	1-8-63	Gas Lubricant Compositions
2,991,671	7-11-61	Wire Grid Forming Apparatus	3,076,065	1-29-63	High-Speed Low-Level Electrical Stepping Switch
2,991,961	7-11-61	Jet Aircraft Configuration	3,077,599	2-12-63	Collapsible Loop Antenna for Space Vehicle
2,996,212	8-15-61	Self Supporting Space Vehicle	3,079,113	2-26-63	Vehicle Parachute and Equipment Jettison System
2,997,274	8-22-61	Turbo-Machine Blade Vibration Damper	3,080,711	3-12-63	Penshape Exhaust Nozzle for Supersonic Engine
3,001,363	9-26-61	Spherical Solid-Propellant Rocket Motor	3,083,611	4-2-63	Multi-Lobar SCAN Horizon Sensor
3,001,395	9-26-61	Air Frame Drag Balance	3,084,421	4-9-63	Reinforced Metallic Composites
3,001,739	9-26-61	Aerial Capsule Emergency Separation Device	3,085,165	4-9-63	Ultra-Long Monostable Multivibrator Employing Bistable Semiconductor Switch to Allow Charging or Timing Circuit
3,004,735	10-17-61	Particle Detection Apparatus	3,087,692	4-30-63	Variable-Span Aircraft
3,005,081	10-17-61	High Intensity Heat and Light Unit	3,088,441	5-7-63	Valve Actuator
3,005,339	10-24-61	Wind Tunnel Airstream Oscillating Apparatus	**3,090,212	5-21-63	Sandwich Panel Construction
3,008,229	11-14-61	Process for Applying a Protective Coating for Salt Bath Brazing	3,090,580	5-21-63	Space and Atmospheric Reentry Vehicle
3,010,372	11-28-61	Folding Apparatus	3,093,000	6-11-63	Check Valve Assembly for a Probe
3,011,760	12-5-61	Transportation Cooled Turbine Blade Manufactured from Wires	3,093,346	6-11-63	Space Capsule
3,012,400	12-21-61	Nozzle	3,098,630	7-23-63	Annular Supersonic Decelerator or Drogue
3,012,407	12-21-61	Insulating Structure	**3,100,294	8-6-63	Time-Division Multiplexer
3,016,693	1-16-62	Electro-Thermal Rocket	3,100,990	8-20-63	Two-Plane Balance
3,016,863	1-15-62	Hydrofoil	3,102,948	9-3-63	Electric Arc Welding
3,022,672	2-27-62	Differential Pressure Cell	3,104,079	9-17-63	Variable-Geometry Winged Reentry Vehicle
3,024,659	3-13-62	Magnetically Centered Liquid Column Float	**3,104,082	9-17-63	Variable Sweep Aircraft Wing
3,028,122	4-3-62	Landing Arrangement for Aerial Vehicles	3,105,515	10-1-63	Pressure Regulating System
3,028,126	4-3-62	Three Axis Controller	**3,106,603	10-8-63	High Voltage Cable
3,028,128	4-3-62	Reentry Vehicle Leading Edge	3,108,171	10-22-63	Radiant Heater Having Formed Filaments
3,038,077	6-5-62	Infrared Scanner			
3,038,175	6-12-62	Survival Couch			
3,041,587	6-26-62	Angular Measurement System			
3,041,924	7-3-62	Motion Picture Camera for Optical Pyrometry			
3,045,424	7-24-62	Method for Continuous Variation of Propellant Flow and Thrust in Propulsive Devices			

Patent No.	Date	Title	Patent No.	Date	Title
3,110,318	11-12-63	Slosh Suppressing Device and Method	**3,160,950	12-15-64	Method and Apparatus for Shock Protection
3,112,672	12-3-63	Umbilical Separator for Rockets	3,162,012	12-22-64	Formed Metal Ribbon Wrap
3,115,630	12-24-63	Reflector Space Satellite	**3,163,935	1-5-65	Mechanical Coordinate Converter
3,118,100	1-14-64	Electric Battery and Method of Operating the Same	3,164,222	1-5-65	Non-Reusable Kinetic Energy Absorber
3,119,232	1-28-64	Rocket Engine	3,164,369	1-5-65	Multistage Multiple-Reentry Turbine
3,120,101	2-4-64	Channel Type Shell Construction for Rocket Engine and the Like	3,165,356	1-12-65	Shock Absorbing Support and Restraint Means
3,120,361	2-4-64	Landing Arrangement for Aerospace Vehicle	3,166,834	1-26-65	Catalyst Bed Removing Tool
3,120,738	2-11-64	Ignition System for Monopropellant Combustion Devices	3,167,426	1-26-65	Nickel-Base Alloy
3,121,309	2-18-64	Spherically Shaped Rocket Motor	3,168,827	2-9-65	Airplane Take-off Performance Indicator
3,122,000	2-25-64	Apparatus for Transferring Cryogenic Liquids	*3,169,001	2-9-65	Aircraft Wheel Spray Drag Alleviator
3,122,098	2-25-64	Apparatus and Method for Control of a Solid Fueled Rocket Vehicle	**3,169,613	2-16-65	Elastic Universal Joint
3,122,885	3-3-64	Injector for Bipropellant Rocket Engines	**3,169,725	2-16-65	Erectable Modular Space Station
3,123,248	3-3-64	Expulsion Bladder Equipped Storage Tank Structure	3,170,286	2-23-65	Injector Valve Device
**3,127,157	3-31-64	Multiple Belleville Spring Assembly	3,170,290	2-23-65	Liquid Rocket System
3,128,389	4-7-64	Variable Frequency Magnetic Multivibrator	3,170,295	2-23-65	Propellant Tank Pressurization System
3,128,845	4-14-64	Despin Weight Release	3,170,324	2-23-65	Aerodynamic Measuring Device
3,130,940	4-28-64	Heat Shield	**3,170,471	2-23-65	Inflatable Honeycomb
3,132,342	5-5-64	Antenna System Using Parasitic Elements and Two Driven Elements at 90° Angle Fed 180° Out of Phase	3,170,486	2-23-65	Two-Component Valve Assembly
3,132,476	5-12-64	Thrust Vector Control Apparatus	3,170,605	2-23-65	Ejection Valve
3,132,479	5-12-64	Universal Restrainer and Joint	3,170,657	2-23-65	Landing Arrangement for Aerial Vehicle
**3,132,903	5-12-64	Slit Regulated Gas Journal Bearing	3,170,660	2-23-65	Parachute Glider
3,135,089	6-2-64	Decomposition Unit	3,170,773	2-23-65	Reinforced Metallic Composites
3,135,090	6-2-64	Rocket Motor System	3,171,060	2-23-65	Plasma Accelerator
3,136,123	6-9-64	Rocket Engine Injector	3,171,081	2-23-65	Ionization Vacuum Gauge
3,138,837	6-30-64	Method of Making Fiber Reinforced Metallic Composites	3,172,097	3-2-65	Binary to Binary-Coded-Decimal Converter
3,139,725	7-7-64	Steerable Solid Propellant Rocket Motor	3,173,246	3-16-65	Colloid Propulsion Method and Apparatus
**3,140,728	7-14-64	High Pressure Four-Way Valve	3,173,251	3-16-65	Apparatus for Igniting Solid Propellants
3,141,340	7-21-64	Gravity Device	3,174,278	3-23-65	Continuously Operating Induction Plasma
3,141,769	7-21-64	Method of Producing Porous Tungsten Ionizers for Ion Rocket Engines	3,174,279	3-23-65	Rocket Thrust Chamber
3,141,932	7-21-64	Switching Mechanism with Energy Storage Means	3,174,827	3-23-65	Production of High Purity Silicon Carbide
**3,143,321	8-4-64	Frangible Tube Energy Dissipation	3,175,789	3-30-65	Landing Pad Assembly for Aerospace Vehicles
3,143,651	8-4-64	X-Ray Reflection Collimator Adapted For Focus X-Radiation Directly On A Detector	3,176,222	3-30-65	Apparatus Having Coaxial Capacitor Structure for Measuring Fluid Density
3,144,219	8-11-64	Manned Space Station	3,176,499	4-6-65	High Temperature Testing Apparatus
3,144,999	8-18-64	Propellant Blade Loading Control	3,176,933	4-6-65	Thermal Control of Space Vehicles
3,145,874	8-18-64	Means For Controlling Rupture Of Shock Tube Diaphragms	*3,177,933	4-13-65	Thermal Switch
3,147,422	9-1-64	Electronic Motor Control System	3,178,883	4-20-65	Attitude Control for Spacecraft
3,149,897	9-22-64	Printed Cable Connector	3,180,264	4-27-65	Coupling for Linear Shaped Charge
3,150,329	9-22-64	Variable Frequency Magnetic Coupled Multivibrator	3,180,587	4-27-65	Attitude Orientation of Spin-Stabilized Space Vehicles
**3,150,387	9-29-64	Foam Generator	3,181,821	5-4-65	Spacecraft Soft Landing System
*3,152,344	10-13-64	Life Preserver	3,182,496	5-11-65	Electric Arc Driven Wind Tunnel
3,155,992	11-10-64	Life Raft	3,183,506	5-11-65	Radar Ranging Receiver
3,156,090	11-10-64	Ion Rocket	3,185,023	5-25-65	Optical Inspection Apparatus
3,157,529	11-1-64	Bonded Solid Lubricant Coating	3,187,583	6-8-65	Space Simulator
3,158,172	11-24-64	High-Temperature, High-Pressure Spherical Segment Valve	3,188,472	6-8-65	Method and Apparatus for Determining Satellite Orientation Utilizing Spatial Energy Sources
3,158,336	11-24-64	Assembly for Recovering a Capsule	3,188,844	6-15-65	Electrical Discharge Apparatus for Forming
**3,158,764	11-24-64	Two-Fluid Magnethydrodynamic System and Method for Thermal-Electric Power Conversion	3,189,299	6-15-65	Dynamic Precession Damper for Spin Stabilized Vehicles
3,159,967	12-8-64	Variable Thrust Ion Engine Utilizing Thermally Decomposable Solid Fuel	**3,189,535	6-15-65	Means and Method of Depositing Thin Films on Substrates
**3,160,825	12-8-64	Temperature Compensating Means for Cavity Resonator of Amplifier	3,189,726	6-15-65	High Temperature Heat Source
			3,189,794	6-15-65	Relay Binary Circuit
			3,189,864	6-15-65	Electrical Connector for Flat Cables
			3,191,316	6-29-65	Lunar Landing Flight Research Vehicle
			3,191,379	6-29-65	Propellant Grain for Rocket Motors

Patent No.	Date	Title	Patent No.	Date	Title
3,191,907	6-29-65	Conical Valve Plug	3,218,547	11-16-65	Flux Sensing Device Using a Tubular Core with Toroidal Gating Coil and Solenoidal Output Coil
3,192,730	7-6-65	Helium Refining by Superfluidity	3,218,850	11-23-65	Thermo-protective Device for Balances
3,193,883	7-13-65	Mandrel for Shaping Solid Propellant Rocket Fuel into a Motor Casing	3,219,250	11-23-65	Flexible Back-up Bar
3,194,060	7-13-65	Seismic Displacement Transducer	3,219,365	11-23-65	Spherical Shield
3,194,525	7-13-65	Supporting and Protecting Device	3,219,828	11-23-65	Vibrating Reticle Star Tracker
3,194,951	7-13-65	Logarithmic Converter	3,220,004	11-23-65	Passive Communication Satellite
3,196,261	7-20-65	Full Binary Adder	3,221,547	12-7-65	Apparatus for Absorbing and Measuring Power
3,196,362	7-20-65	Temperature Compensated Solid State Differential	**3,221,549	12-7-65	Aircraft Instrument
3,196,557	7-27-65	Centrifuge Mounted Mass Simulator	*3,223,374	12-14-65	Miniature Vibration Isolator
3,196,558	7-27-65	Means for Visually Indicating Flight Paths of Vehicles Between Two Points	3,224,001	12-14-65	Inflatable Radar Reflector Unit
3,196,598	7-27-65	Inlet Deflector for Jet Engines	3,224,173	12-21-65	Liquid-gas Separator System
3,196,675	7-27-65	Optical Torquemeter	3,224,263	12-21-65	Null-type Vacuum Microbalance
3,196,690	7-27-65	Impact Simulator	3,224,336	12-21-65	Missile Launch Release System
3,197,616	7-27-65	Temperature Regulation Circuit	3,228,492	1-11-66	Double-Acting Shock Absorber
3,198,955	8-3-65	Binary Magnetic Memory Device	3,228,558	1-11-66	Measuring Device
3,199,340	8-10-65	Accelerometer with F.M. Output	3,229,099	1-11-66	Electro-Optical Alignment Control System
3,199,343	8-10-65	Electric Propulsion Engine Test Chamber	3,229,102	1-11-66	Radiation Direction Detector Including Means for Compensating for Photocell Aging
3,199,931	8-10-65	Externally Pressurized Fluid Bearing	3,229,139	1-11-66	High Temperature Spark Plug
3,200,706	8-17-65	Gas Actuated Bolt Disconnect	3,229,155	1-11-66	Electric Arc Device for Heating Gases
3,201,560	8-17-65	Electric-Arc Heater	3,229,463	1-18-66	Trajectory-correction Propulsion System
3,201,635	8-17-65	Method and Apparatus for Producing a Plasma	3,229,568	1-18-66	Concave Grating Spectrometer
3,201,980	8-24-65	Thrust Dynamometer	3,229,636	1-18-66	Missile Stage Separation Indicator and Stage Initiator
3,202,381	8-24-65	Recoverable Rocket Vehicle	3,229,682	1-18-66	Device for Directionally Controlling Electromagnetic Radiation
3,202,398	8-24-65	Locking Device for Turbine Rotor Blades	3,229,689	1-18-66	Resuscitation Apparatus
3,202,844	8-24-65	Energy Conversion Apparatus	3,229,884	1-18-66	Segmented Back-up Bar
3,202,915	8-24-65	Particle Beam Measurement Apparatus Using Beam Kinetic Energy to Change the Heat Sensitive Resistance of the Detection Probe	3,229,930	1-18-66	Stretch Yo-Yo De-spin Mechanism
**3,202,998	8-24-65	Flexible Foam Erectable Space Structure	**3,230,053	1-18-66	Apparatus for Producing High Purity Silicon Carbide Crystals
3,204,447	9-7-65	Enthalphy and Stagnation Temperature Determination of a High Temperature Laminar Flow Gas Stream	3,230,377	1-18-66	Self-stabilized Theodolite for Manual Tracking Using Photosensitive Stabilizing Means
3,204,889	9-7-65	Space Vehicle Electrical System	3,236,066	2-22-66	Energy Absorption Device
3,205,361	9-7-65	Light Sensitive Digital Aspect Sensor	3,237,253	3-1-66	Method of Making Screen by Casting
3,205,362	9-7-65	Photosensitive Device to Detect Bearing Deviation	3,238,345	3-1-66	Hypersonic Test Facility
3,205,381	9-7-65	Ionospheric Battery	3,238,413	3-1-66	Magnetically Controlled Plasma Accelerator
3,206,141	9-14-65	Space Vehicle Attitude Control	3,238,715	3-8-66	Electrostatic Ion Engine Having a Permanent Magnetic Circuit
3,208,215	9-28-65	Gimbaled, Partially Submerged Rocket Nozzle	3,238,730	3-8-66	Anti-backlash Circuit for Hydraulic Drive System
3,208,272	9-28-65	Surface Roughness Detector	3,238,774	3-8-66	Pressurized Cell Micrometeroid Detector
3,208,694	9-28-65	Nose Gear Steering System for Vehicle with Main Skid	*3,238,777	3-8-66	Differential Temperature Transducer
3,208,707	9-28-65	Pivotal Shock Absorbing Pad Assembly	3,239,660	3-8-66	Illumination System Including a Virtual Light Source
3,209,360	9-28-65	Antenna Beam-Shaping Apparatus	3,242,716	3-29-66	Apparatus for Measuring Thermal Conductivity
3,209,361	9-28-65	Cassegrainian Antenna Subreflector	3,243,154	3-29-66	Vibration Damping System
		Flange for Suppressing Ground Noise	3,243,791	3-29-66	Bi-carrier Demodulator with Modulation
3,210,927	10-12-65	Electro-Thermal Rockets Having Improved Heat Exchangers	3,249,012	5-3-66	Umbilical Disconnect
3,211,169	10-12-65	Shrink-fit Gas Valve	**3,249,013	5-3-66	Remote Controlled Tubular Disconnect
3,211,414	10-12-65	Thermally Operated Valve	3,251,053	5-10-66	Analog to Digital Converter
3,212,096	10-12-65	Parabolic Reflector Horn Feed With Spillover Correction	3,252,100	5-17-66	Pulse Generating Circuit
3,212,259	10-15-65	Tertiary Flow Injection Thrust Vectoring System	3,254,395	6-7-66	Method for Making a Rocket Motor Casing
3,212,325	10-12-65	Force Measuring Instrument	3,254,487	6-7-66	Rocket Motor Casing
3,212,564	10-19-65	Heat Conductive Resiliently Compressible Structure for Space Electronic Package Modules	3,257,780	6-28-66	Zero Gravity Separator
3,215,572	11-02-65	Low Viscosity Magnetic Fluid Obtained by the Colloidal Suspension of Magnetic Particles	3,258,382	6-28-66	Energy Management System for Glider Type Vehicle
*3,215,842	11-02-65	Optical Communication System	3,258,687	6-28-66	Wide Range Linear Fluxgate Magnetometer
3,216,007	11-02-65	Analog-to-Digital Conversion System	3,258,831	7-5-66	Method of Making a Molded Connector
**3,217,624	11-16-65	Electrically-operated Rotary Shutter			
3,218,479	11-16-65	Phase Detector Assembly			

Patent No.	Date	Title	Patent No.	Date	Title
3,258,912	7-5-66	Method of Igniting Solid Propellants	3,274,304	9-20-66	Method of Making Impurity-Type Semiconductor Electrical Contacts
3,258,918	7-5-66	Fluid Dispensing Apparatus and Method	*3,276,251	10-4-66	Test Unit Free-Flight Suspension System
**3,260,055	7-12-66	Automatic Thermal Switch	3,276,376	10-4-66	Thrust and Direction Control Apparatus
3,260,204	7-12-66	Velocity Package	3,276,602	10-4-66	Cable Arrangement for Rigid Tethering
3,260,326	7-12-66	Wind-tunnel Microphone Structure	3,276,679	10-4-66	Separator
3,261,210	7-19-66	Superconductive Accelerometer	3,276,722	10-4-66	Flight Craft
3,262,186	7-26-66	Method of Improving the Reliability of a Rolling Element System	3,276,726	10-4-66	Inflation System for Balloon Type Satellites
3,262,262	7-26-66	Electrostatic Ion Rocket Engine	3,276,865	10-4-66	High Temperature Cobalt-Base Alloy
3,262,351	7-26-66	Separation Nut	3,276,866	10-4-66	Nickel-Base Alloy Containing Mo-W-Al-Cr-Ta-Zr-C-Nb-B
3,262,365	7-26-66	Space Capsule Ejection Assembly	3,276,946	10-4-66	Low Friction Magnetic Recording Tape
3,262,395	7-26-66	Hydraulic Transformer	3,277,314	10-4-66	High-Efficiency Multivibrator
3,262,518	7-26-66	Emergency Escape System	3,277,366	10-4-66	Insertion Loss Measuring Apparatus Having Transformer Means Connected Across a Pair of Bolometers
3,262,655	7-26-66	Alleviation of Divergence During Rocket Launch	3,277,373	10-4-66	Serrodyne Frequency Converter Re-entrant Amplifier System
3,263,016	7-26-66	Black-body Furnace	3,277,375	10-4-66	Reentry Communication by Material Addition
3,263,171	7-26-66	Micro Current Measuring Device Using Plural Logarithmic Response Heated Filamentary Type Diodes	3,277,458	10-4-66	Condition and Condition Duration Indicator
3,263,610	8-2-66	Quick-Release Connector	3,277,486	10-4-66	Method and Means for Damping Nutation in a Satellite
**3,264,135	8-2-66	Method of Coating Carbonaceous Base To Prevent Oxidation Destruction and Coated Base	3,279,193	10-18-66	Method and Construction for Protecting Heat Sensitive Bodies From Thermal Radiation and Convective Heat
3,270,441	9-6-66	Reduced Gravity Simulator	3,281,963	11-01-66	Training Vehicle for Controlling Attitude
3,270,499	9-6-66	Injector Assembly for Liquid Fueled Rocket Engines	3,281,964	11-01-66	Rotating Space Station Simulator
3,270,501	9-6-66	Aerodynamic Spike Nozzle	**3,281,965	11-01-66	Controlled Visibility Device for an Aircraft
3,270,503	9-6-66	Ablation Structures	3,282,035	11-01-66	Molecular Beam Velocity Selector
3,270,504	9-6-66	Automatically Deploying Nozzle Exit Cone Extension	3,282,091	11-01-66	Instrument for Measuring Torsional Creep and Recovery
3,270,505	9-6-66	Control System for Rocket Vehicles	3,282,532	11-01-66	Stabilization of Gravity Oriented Satellites
**3,270,512	9-6-66	Intermittent Type Silica gel Absorption Refrigerator	3,282,541	11-01-66	Attitude Control System for Sounding Rockets
3,270,565	9-6-66	Omnidirectional Acceleration Device	3,282,739	11-01-66	Non-magnetic Battery Case
3,270,756	9-6-66	Fluid Flow Control Valve	**3,282,740	11-01-66	Sealed Battery Gas Manifold Construction
3,270,802	9-6-66	Method and Apparatus for Varying Thermal Conductivity	3,283,088	11-01-66	Multiple Circuit Switch Apparatus With Improved Pivot Actuator Structure
3,270,835	9-6-66	Device for Suppressing Sound and Heat Produced by High-velocity Exhaust Jets	3,283,175	11-01-66	AC Logic Flip-Flop Circuits
3,270,908	9-6-66	Space Capsule	3,283,241	11-01-66	Apparatus for Field Strength Measurement of a Space Vehicle
3,270,985	9-6-66	Reactance Control System	3,286,274	11-22-66	Pressure suit tie-down mechanism
3,270,986	9-6-66	Hand-held Self-maneuvering Unit	3,286,531	11-22-66	Omni-Directional Anisotropic Molecular Trap
3,270,988	9-6-66	Minimum Induced Drag Airfoil Body	3,286,629	11-22-66	Multi-mission module
**3,270,989	9-6-66	Variable Sweep Aircraft	3,286,630	11-22-66	Spacecraft separation system for spinning vehicles and/or payloads
3,270,990	9-6-66	Absorptive Splitter for Closely Spaced Supersonic Engine Air Inlets	3,286,882	11-22-66	Booster tank system
3,271,140	9-6-66	High Temperature Cobalt-Base Alloy	3,286,953	11-22-66	Roll attitude star sensor system
**3,271,181	9-6-66	Method of Coating Carbonaceous Base To Prevent Oxidation Destruction and Coated Base	3,286,957	11-22-66	Flexible wing deployment device
3,271,532	9-6-66	Three-axis Finger Tip Controller for Switches	3,287,031	11-22-66	Indexed Keyed Connection
3,271,558	9-6-66	Spectral Method for Monitoring Atmospheric Contamination of Inert-gas Welding Shields	3,287,174	11-22-66	Prevention of pressure build-up in electrochemical cells
3,271,594	9-6-66	Transient Augmentation Circuit for Pulse Amplifiers	3,287,496	11-22-66	Digital television camera control system
**3,271,620	9-6-66	Starting Circuit for Vapor Lamps and the Like	3,287,582	11-22-66	Apparatus for increasing ion engine beam density
3,271,637	9-6-66	Gas Solar Detector Using Manganese as a Doping Agent	3,287,640	11-22-66	Pulse Counting circuit which simultaneously indicates the occurrence of the Nth pulse
3,271,649	9-6-66	Regenerative Braking System	**3,287,660	11-22-66	Solid State chemical source for ammonia beam maser
3,273,094	9-13-66	Superconducting Magnet	3,287,725	11-22-66	Phase-locked loop with a sideband rejecting properties
3,273,355	9-20-66	Heat Protective Apparatus	3,289,205	11-29-66	Method & Apparatus for determining Electromagnetic characteristics of Large Surface Area Passive Reflectors
3,273,381	9-20-66	Means and Method of Measuring Viscoelastic Strain			
3,273,388	9-20-66	Apparatus for Measuring Electric Field Strength on the Surface of a Model Vehicle			
3,273,392	9-20-66	Hot Wire Liquid Level Detector for Cryogenic Fluids			
3,273,399	9-20-66	Traversing Probe			

Patent No.	Date	Title	Patent No.	Date	Title
3,295,360	01-03-67	Dynamic sensor	3,305,415	02-21-67	Process for preparing sterile solid propellants
*3,295,366	01-03-67	Support apparatus for dynamic testing	3,305,636	02-21-67	Phase-shift data transmission system having a pseudo-noise sync code modulated with the data in a single channel
3,295,377	01-03-67	Angular accelerometer	**3,305,801	02-21-67	Variable time constant smoothing circuit
3,295,386	01-03-67	Three axis controller	**3,305,810	02-21-67	Solenoid construction
3,295,512	01-03-67	Foldable solar concentrator	3,305,861	02-21-67	Closed Loop Ranging System
3,295,545	01-03-67	Liquid storage tank venting device for zero gravity environment	3,305,870	02-21-67	Dual Mode Horn Antenna
3,295,556	01-03-67	Foldable conduit	3,307,407	03-07-67	Micro-particle impact sensing apparatus
**3,295,684	01-03-67	High pressure filter	3,308,848	03-14-67	Fluid power transmission
3,295,699	01-03-67	Folding boom assembly	3,309,012	03-14-67	Thermal pump-compressor for space use
3,295,782	01-03-67	Endless tape cartridge	3,309,961	03-21-67	Hermetically sealed explosive release mechanism
3,295,790	01-03-67	Recoverable single stage spacecraft booster	*3,310,054	03-21-67	File card marker
3,295,791	01-03-67	Storage container mounting for space vehicles	*3,310,138	03-21-67	Viscous-pendulum damper
3,295,798	01-03-67	Landing gear	3,310,256	03-21-67	Aerodynamic protection for space flight vehicles
**3,295,808	01-03-67	Parallel motion suspension device	3,310,258	03-21-67	Technique for control of free-flight rocket vehicles
3,296,060	01-03-67	Unrefined-ceramic flame resistant insulation and method of making the same	3,310,261	03-21-67	Control for flexible parawing
3,296,526	01-03-67	Micrometeoroid velocity measuring device	3,310,262	03-21-67	Supersonic Aircraft
3,296,531	01-03-67	Electrostatic plasma modulator for space vehicle re-entry communication	3,310,443	03-21-67	Method of forming thin window drifted silicon charged particle detector
3,298,175	01-17-67	Method and device for cooling	3,310,978	03-28-67	Fiber optic vibration transducer and analyzer
3,298,182	01-17-67	Ignition means for monopropellant	3,310,980	03-28-67	Hydraulic support for dynamic testing
3,298,221	01-17-67	Densitometer	**3,311,315	03-28-67	Endless tape transport mechanism
3,298,285	01-17-67	Reinforcing means for diaphragms	3,311,502	03-28-67	Didymium hydrate additive to nickel hydroxide electrodes
3,298,362	01-17-67	Instrument for use in performing a controller Valsalva Maneuver	3,311,510	03-28-67	Method of making a silicon semiconductor device
3,298,582	01-17-67	Camera film feed having a detent means	3,311,748	03-28-67	Sun tracker with rotatable plane-parallel plate and two photocells
*3,299,364	01-17-67	Folded traveling wave maser structure	**3,311,772	03-28-67	Focussing system for an ion source having apertured electrodes
3,299,431	01-17-67	Unfurtable structure including coiled strips thrust launched upon tension release	3,311,832	03-28-67	Multiple Input Radio Receiver
3,299,913	01-24-67	Adjustable Tension Wire Guide	3,312,101	04-04-67	Gas Analyzer for Bi-gaseous mixtures
3,300,162	01-24-67	Radial module space station	3,316,716	05-02-67	Composite Powerplant and Shroud Therefor
3,300,717	01-24-67	Method & Apparatus for measuring potentials in plasmas	3,316,752	05-02-67	Method and Apparatus for detection and location of microleaks
3,300,721	01-24-67	Means for communication through a layer of ionized gases	*3,316,991	05-02-67	Automatic Force measuring system
3,300,847	01-31-67	Portable alignment tool	3,317,180	05-02-67	High Pressure regulator valve
3,300,949	01-31-67	Liquid-gas separator for zero gravity environment	3,317,341	05-02-67	Metallic film diffusion for boundary lubrication
3,300,981	01-31-67	Zero gravity starting means for liquid propellant motors	3,317,352	05-02-67	Method for determining the state of charge of batteries by the use of tracers
3,301,046	01-37-67	Method of obtaining permanent record of surface flow phenomena	3,317,641	05-02-67	Method For Molding Compounds
3,301,315	01-31-67	Thermal conductive connection and method of making same	3,317,731	05-02-67	Canopus Detector Including Automatic Gain Control of Photomultiplier Tube
3,301,507	01-31-67	Hypersonic Re-entry Vehicle	3,317,751	05-02-67	Reversible Ring Counter Employing Cascaded Single SCR Stages
3,301,511	01-31-67	Wing Deployment Method and Apparatus	3,317,797	05-02-67	Microelectronic Module Package
3,301,578	01-31-67	Cryogenic connector for vacuum use	3,317,825	05-02-67	Three-Wire Ground Type Electrical Receptacle Tester
3,302,023	01-31-67	Apparatus for producing three dimensional recordings of fluorescence spectra	3,317,832	05-02-67	Single or Joint Amplitude Distribution Analyzer
3,302,040	01-31-67	Linear sawtooth voltage-wave generator employing transistor timing circuit having capacitor-zener diode combination feedback	3,317,846	05-02-67	Linear Accelerator for Micrometeoroids Having a Variable Voltage Source
3,302,569	02-07-67	Quick release separation mechanism	3,318,093	05-09-67	Hydraulic Drive Mechanism
3,302,633	02-07-67	Universal pilot restraint suit and body support therefor	3,318,096	05-09-67	Purge Device for Thrust Engines
*3,302,662	02-07-67	Antiflutter ball check valve	3,318,343	05-09-67	Tool Attachment for Spreading Loose Elements Away From Work
3,302,960	02-07-67	Locking device with rolling detents	*3,318,622	05-09-67	All-Directional Fastener
3,303,304	02-07-67	Discrete Local Altitude Sensing Device	3,319,175	05-09-67	Electronic Amplifier With Power Supply Switching
3,304,028	02-14-67	Attitude control for spacecraft	3,319,975	05-16-67	Quick Attach and Release Fluid Coupling Assembly
3,304,718	02-21-67	Double optic system for ion engine	3,320,649	05-23-67	Line Cutter
3,304,724	02-21-67	Tank construction for space vehicles	3,321,034	05-23-67	Sample Collecting Impact Bit
3,304,729	02-21-67	Cryogenic Storage System			
*3,304,768	02-21-67	Fatigue testing device			
3,304,773	02-21-67	Force transducer			
3,304,799	02-21-67	Proportional controller			
3,304,865	02-21-67	Self-sealing, unbonded, rocket motor nozzle closure			

Patent No.	Date	Title	Patent No.	Date	Title
3,321,154	05-23-67	Transpirationally Cooled Heat Ablation System	3,340,395	09-05-67	Time-of-flight mass spectrometer with feed-back means from the detector to the low sources and a specific counter
3,321,157	05-23-67	Double-Hinged Flap	3,340,397	09-05-67	Multiple environment materials test chamber having a multiple port X-ray tube for irradiating a plurality of samples
3,321,159	05-23-67	Techniques for Insulating Cryogenic Fuel Containers	**3,340,430	09-05-67	Diode and protection fuse unit
*3,321,570	05-23-67	Printed circuit board with bellows rivet connection	3,340,532	09-05-67	Tracking receiver
3,321,628	05-23-67	Baseline stabilization system for ionization detector	3,340,599	09-12-67	Simple method of making photovoltaic junctions
**3,321,645	05-23-67	Switching circuit employing regeneratively connected complementary transistors	3,340,713	09-12-67	Spin forming tubular elbows
3,321,922	05-30-67	Small Rocket Engine	3,340,727	09-12-67	Ablation Probe
3,323,356	06-06-67	Apparatus for Positioning and Loading a test specimen	3,340,732	09-12-67	Meteorological Balloon
3,323,362	06-06-67	Positive Displacement Flowmeter	3,341,151	09-12-67	Apparatus providing a directive field pattern and attitude sensing of a spin stabilized satellite
3,323,370	06-06-67	Mass measuring system	3,341,169	09-12-67	Filler Valve
**3,323,386	06-06-67	Two-axis controller	3,341,708	09-12-67	Amplitude modulated laser transmitter
3,323,408	06-06-67	Optical alignment system	3,341,778	09-12-67	Optimum pre-detection diversity receiving system
3,323,484	06-06-67	Liquid Flow Sight Assembly	**3,341,977	09-19-67	Conforming Polisher for aspheric surfaces of revolution
**3,323,967	06-06-67	Masking Device	3,342,055	09-19-67	Protective device for machine and metalworking tools
3,324,370	06-06-67	Electronic Beam Switching Commutator	3,342,066	09-19-67	Model launcher for wind tunnels
3,324,388	06-06-67	Meteoroid sensing apparatus having a coincidence network connected to a pair of capacitors	*3,342,653	09-19-67	Method of making inflatable honeycomb
**3,324,423	06-06-67	Dual waveguide mode source having control means for adjusting the relative amplitudes of two modes	*3,343,180	09-26-67	Stretcher
3,324,659	06-13-67	Electrostatic Thruster with Improved Insulators	3,343,189	09-26-67	Rescue litter floatation assembly
3,325,229	06-13-67	Air Bearing	3,344,340	09-26-67	Regulated power supply
3,325,723	06-13-67	Voltage-current characteristic simulator	3,344,425	09-26-67	Monopulse Tracking System
3,325,749	06-13-67	Variable Frequency Oscillator with Temperature Compensation	3,345,820	10-10-67	Electron Bombardment Ion Engine
3,326,043	06-20-67	Inductive Liquid Level Detection System	3,345,822	10-10-67	Burning rate control of solid propellants
3,326,407	06-20-67	Thin-walled pressure vessel	3,345,840	10-10-67	Tube Dimpling Tool
3,327,298	06-20-67	System for recording and reproducing pulse code modulated data	*3,345,866	10-10-67	Multilegged Support System
*3,327,991	06-27-67	Valve seat with Resilient Support Member	3,346,419	10-10-67	Solar cell mounting
3,328,624	06-27-67	High efficiency ionizer assembly	3,346,515	10-10-67	Method of producing alternating ether-siloxane copolymers
3,329,375	07-04-67	Attitude Control and damping system for spacecraft	3,346,724	10-10-67	Random Function Tracer
3,329,918	07-04-67	High voltage divider system	3,346,806	10-10-67	Pressure monitoring with a plurality of ionization gauges controlled at a central location
3,330,052	07-11-67	Subgravity Simulator	3,346,929	10-17-67	Latching Mechanism
**3,330,082	07-11-67	Central sparand module joint	3,347,046	10-17-67	Control of transverse instability in rocket combustors
3,330,510	07-11-67	Orbital Escape Device	3,347,057	10-17-67	Rapid cooling method and apparatus
3,330,549	07-11-67	Shock Absorber	3,347,309	10-17-67	Self Adjusting Multi-Segment, Deployable Natural Circulation Radiator
3,331,071	07-11-67	Satellite Communication System	3,347,465	10-17-67	Prestressed refractor structure
3,331,246	07-18-67	Hypersonic test facility	3,347,466	10-17-67	Nacelle Afterbody for jet engines
3,331,255	07-18-67	Non-magnetic, explosive actuated indexing device	3,347,531	10-17-67	Stirring apparatus for plural test tubes
3,331,404	07-18-67	Apparatus for purging systems handling	3,347,665	10-17-67	Low temperature aluminum alloy
3,331,951	07-18-67	Trigonometric Vehicle Guidance Assembly which aligns the three perpendicular axes of two-axes systems	3,348,048	10-17-67	Horizon sensor with a plurality of fixedly-positioned radiation-compensated radiation sensitive detector
**3,333,152	07-25-67	Self-repeating plasma accelerator	3,348,053	10-17-67	Amplifier Clamping Circuit for horizon scanner
3,333,788	08-01-67	Artificial gravity spin deployment system	3,348,152	10-17-67	Diversity receiving system
3,336,725	08-22-67	Canister closing device	3,349,814	10-31-67	Method and apparatus for making a heat insulating and ablative structure
3,336,748	08-22-67	Plasma Device Feed System	3,350,033	10-31-67	Reaction wheel scanner
3,337,004	08-22-67	Impact energy absorber	3,350,034	10-31-67	Satellite appendage tie-down cord
3,337,279	08-22-67	Gas purged dry box glove	3,350,643	10-31-67	Signal-to-noise ratio estimated by taking ratio of mean and standard deviation of integrated signal samples
3,337,315	08-22-67	Method for Fiberizing Ceramic Materials	**3,350,671	10-31-67	High power-high voltage waterload
3,337,337	08-22-67	Method for producing fiber reinforced metallic composites	**3,350,926	11-07-67	Miniature Stress Transducer
**3,337,790	08-22-67	Mercury capillary interrupter	3,352,157	11-14-67	Inertia diaphragm pressure transducer
3,337,812	08-22-67	Circulator having quarter wavelength resonant post and parametric amplifier circuits utilizing the same	*3,352,192	11-14-67	Split nut separation system
3,339,404	09-05-67	Lunar Penetrometer	3,353,359	11-21-67	Multislot film cooled pyrolytic graphite rocket nozzle
3,339,863	09-05-67	Solar vane actuator	3,354,098	11-21-67	Elastomeric Silazane polymers and process for preparing the same
3,340,099	09-05-67	Bonded elastomeric seal for electrochemical cells	3,354,320	11-21-67	Light position locating system

Patent No.	Date	Title	Patent No.	Date	Title
3,354,462	11-21-67	Event Recorder	3,370,039	02-20-68	Process for Preparation of High-Molecular-Weight Polyaryloxsilanes
3,355,861	12-05-67	Mixture Separation Cell	3,372,588	03-12-68	Constant temperature heat sink for calorimeters
3,355,948	12-05-67	Spherical Tank Gauge	*3,373,069	03-12-68	Method of Making an Inflatable Panel
3,356,320	12-05-67	Device for Separating Occupant from an ejection seat	3,373,404	03-12-68	Error-Correcting Method and Apparatus
*3,356,549	12-05-67	Method and apparatus for bonding a plastics sleeve onto a metallic body	3,373,430	03-12-68	Omnidirectional Microwave Spacecraft Antenna
3,356,885	12-05-67	Small plasma probe	3,373,431	03-12-68	Low Noise Single Aperture Multimode Monopulse Antenna Feed System
3,357,024	12-05-67	Method of recording a gas flow pattern	3,373,640	03-19-68	Apparatus for Machining Geometric Cones
*3,357,093	12-12-67	Soldering with solder flux which leaves corrosion-resistant coating	3,373,914	03-19-68	Automatic Welding Speed Controller
3,357,237	12-12-67	Ablation Sensor	3,374,339	03-19-68	Counter and Shift-Register
3,357,862	12-12-67	Combined Electrolysis device and fuel cell and method of operation	3,374,366	03-19-68	Complementary Regenerative Switch
3,358,145	12-12-67	Radiation detector readout system	**3,374,830	02-26-68	Thermal Control Panel
*3,358,264	12-12-67	Coaxial Cable Connector	3,374,966	03-26-68	Control System
3,359,046	12-19-67	Bismuth-lead coatings for gas bearings used in atmospheric environments and vacuum chambers	3,375,451	03-26-68	Adaptive Tracking Notch Filter System
3,359,132	12-19-67	Method of coating circuit paths on printed circuit boards with solder	3,375,479	03-26-68	Continuous Turning Slip Ring Assembly
3,359,409	12-19-67	Correlation function apparatus	3,376,730	04-09-68	Friction Measuring Apparatus
**3,359,435	12-19-67	Holder for crystal resonators	3,377,208	04-09-68	Thermocouple Assembly
3,359,555	12-19-67	Polarization diversity monopulse tracking receiver	3,377,845	04-16-68	Moment of Inertia Test Fixture
*3,359,819	12-26-67	Bidirectional step torque filter with zero backlash characteristic	3,378,315	04-16-68	Hybrid Lubrication System and Bearing
*3,359,855	12-26-67	Optical projector system	3,378,851	04-23-68	Soft Frame Adjustable Eyeglasses
3,360,798	12-26-67	Collapsible reflector	*3,378,892	04-23-68	Quick Attach Mechanism
3,360,864	01-02-68	Internal flare angle gauge	3,379,064	04-23-68	Automatic Recording McLeod Gauge
**3,360,972	01-02-68	Magnetomotive metal working device	3,379,330	04-23-68	Cryogenic Insulation System
3,360,980	01-02-68	Vapor pressure measuring system and method	3,379,885	04-23-68	Sight Switch Using an Infrared Source and Sensor
3,360,988	01-02-68	Electric arc apparatus	3,379,974	04-23-68	Particle Detection Apparatus Including a Ballistic Pendulum
3,361,045	01-02-68	Fast-opening diaphragm	3,380,042	04-23-68	Digital Telemetry System
**3,361,067	01-02-68	Piezoelectric pump	3,380,049	04-23-68	Method of Resolving Clock Synchronization Error and Means Therefor
3,361,400	01-02-68	Clamping assembly for components	*3,381,339	05-07-68	Hydraulic Casting of Liquid Polymers
		inertial	3,381,517	05-07-68	Rotary Bead Dropper and Selector For Testing Micrometeorite Detectors
*3,361,666	01-02-68	Inorganic solid film lubricants	3,381,527	05-07-68	Tension Measurement Device
3,361,985	01-02-68	Signal detection and tracking apparatus	3,381,569	05-17-68	Attitude Sensor For Space Vehicles
3,364,311	01-16-68	Elimination of frequency shift in a multiplex communication system	3,381,778	05-07-68	Energy Absorbing Device
3,364,366	01-16-68	Multiple Slope Sweep Generator	**3,382,082	05-07-68	Foamed-In-Place Ceramic Refractory Insulating Material
*3,364,578	01-23-68	Ellipsograph for Pantograph	3,382,105	05-17-68	Ion-Exchange Membrane and Electrode Assembly
3,364,631	01-23-68	Inflatable Support Structure	3,382,107	05-17-68	Sealing Device For An Electrochemical Cell
3,364,777	01-23-68	Null Device for Hand Controller	3,382,714	05-14-68	Heat Sensing Instrument
3,364,813	01-23-68	Self-Calibrating displacement transducer	3,383,461	05-14-68	Reduced Bandwidth Video Communication System Utilizing Sampling Technique
3,365,580	01-23-68	Film reader with transparent capstan and U-shaped light conducting rod	3,383,524	05-14-68	Solid State Pulse Generator With Constant Output Width, For Variable Input Width, In Nanosecond Range
3,365,657	01-23-68	Power Supply	3,383,903	05-21-68	Pressure Transducer Calibrator
3,365,665	01-23-68	Hall current measuring apparatus having a series resistor for temperature compensation	3,383,922	05-21-68	Linear Differential Pressure Sensor
3,365,897	01-30-68	Cryogenic Thermal Insulation	3,384,016	05-21-68	Lateral Displacement System For Separated Rocket Stages
3,365,930	01-30-68	Thermal shock apparatus	3,384,075	05-21-68	Thermal Control Wall Panel
3,365,941	01-30-68	Precision thrust gage	3,384,111	05-21-68	Positive Locking Check Valve
3,366,886	01-30-68	Linear accelerator frequency control system	**3,384,324	05-21-68	Thermal Control Wall Panel
3,366,894	01-30-68	Variable duration pulse integrator	*3,384,820	05-21-68	Vibrating Element Electrometer With Output Signal Magnified Over Input Signal By A Function Of The Mechanical Q Of The Vibrating Element
3,367,114	02-06-68	Construction and Method of Arranging a Plurality of Ic: Engines			
**3,367,121	02-06-68	Refrigeration device	3,384,895	05-21-68	Portable Superclean Air Column Device
3,367,182	02-06-68	Heat Flux System	3,385,036	05-28-68	Portable Superclean Air Column Device
3,367,224	02-06-68	Aligning and Positioning Device	3,386,337	06-04-68	Portable Milling Tool
3,367,271	02-06-68	Automatic Pump	**3,386,685	06-04-68	Spacecraft Airlock
3,367,308	02-06-68	Exposure system for animals	3,386,666	06-04-68	Station Keeping Of A Gravity-Gradient Stabilized Satellite
*3,367,445	02-06-68	Fluid Lubricant System	3,387,149	06-04-68	Phonocardiograph Transducer
3,368,486	02-13-68	Single Action Separation Mechanism	3,388,258	06-11-68	Fluid Flow Meter With Comparator Reference Means
3,369,222	02-13-68	Data Compressor			
3,369,223	02-13-68	Incremental tape recorder and data rate converter			
3,369,564	02-20-68	Transfer Valve			

Patent No.	Date	Title	Patent No.	Date	Title
**3,388,387	06-11-68	Drive Circuit Utilizing Two Cores	3,407,304	10-22-68	Micrometeoroid Penetration Measuring Device
**3,388,590	06-18-68	Connector Internal Force Gauge	3,408,816	11-05-68	Rocket Engine Injector
3,389,017	06-18-68	Sealing Member And Combination Thereof And Method Of Producing Said Sealing Member	3,408,861	11-05-68	Rocket Engine Thrust Vector Deviation Measurement Device
3,389,260	06-18-68	Solar Sensor Having Coarse And Fine Sensing With Matched Preirradiated Cells and Method of Selecting Cells	3,408,870	11-05-68	Zero Gravity Apparatus
3,389,346	06-18-68	Compensating Bandwidth Switching Transients In An Amplifier Circuit	3,409,247	11-05-68	Solid State Thermal Control Polymer Coating
3,389,877	06-25-68	Inflatable Tether	3,409,252	11-05-68	Controllers
3,390,017	06-25-68	Sealed Electrochemical Cell Provided With A Flexible Casing	3,409,554	11-05-68	Gd or Sm Doped Silicon Semi-Conductor Composition
3,390,020	06-25-68	Semiconductor Material And Method Of Making Same	3,409,730	11-05-68	Thermal Radiation Shielding
3,390,282	06-25-68	Passive Synchronized Spike Generator With High Input Impedance And Low Output Impedance And Capacitor Power Supply	*3,411,356	11-19-68	Zeta Potential Flow Meter
**3,390,378	06-25-68	Comparator For The Comparison Of Two Binary Numbers	3,412,559	11-26-68	Ion Engine Casing Construction And Method of Making Same
3,391,080	07-02-68	Metallic Film Diffusion For Boundary Lubrication	3,412,598	11-26-68	Impact Testing Machine
3,392,403	07-09-68	Measurement Of Time Differences Between Luminous Events	*3,412,729	11-26-68	Method And Apparatus For Continuously Monitoring Blood Oxygenation, Blood Pressure, Pulse Rate and The Pressure Pulse Curve Utilizing An Ear Oximeter As Transducer
3,392,586	07-16-68	Device For Measuring Pressure	3,412,961	11-26-68	Means For Suppressing Or Attenuating Bending Motion Of Elastic Bodies
3,392,864	07-16-68	Insulation System	*3,413,115	11-26-68	Brazing Alloy
3,392,865	07-16-68	Filament-Wound Container	3,413,510	11-26-68	Electronic Cathode Having A Brush-Like Structure And A Relatively Thick Oxide Emissive Coating
3,392,936	07-16-68	Leading Edge Curvature Based On Convective Heating	3,413,536	11-26-68	Automatic Battery Charger
**3,393,059	07-16-68	Decontamination of Petroleum Products	3,414,012	12-03-68	Dual Latching Solenoid Valve
3,393,330	07-16-68	Thermionic Converter With Current Augmented By Self-Induced Magnetic Field	3,414,358	12-03-68	Optical Monitor Panel
3,393,332	07-16-68	Superconducting Alternator	3,415,032	12-10-68	Evacuation Port Seal
3,393,380	07-16-68	Phase Locked Phase Modulator Including A Voltage Controlled Oscillator	3,415,069	12-10-68	High Pressure Helium Purifier
3,393,347	07-16-68	Power Supply Circuit	3,415,116	12-10-68	Floating Two-Force-Component Measuring Device
3,393,384	07-16-68	Radio Frequency Coaxial High Pass Filter	3,415,126	12-10-68	Azimuth Laying System
3,394,359	07-23-68	Digital Memory Sense Amplifying Means	3,415,156	12-10-68	Controlled Release Device
3,394,975	07-30-68	Petzval Type Objective Including Field Shaping Lens	*3,415,556	12-10-68	Ceramic-To-Metal Seal And Method Of Making Same
**3,395,053	07-30-68	Thermal Control Coating	3,415,643	12-10-68	High Temperature Ferromagnetic Cobalt-Base
3,396,057	08-06-68	Method Of Electrolytically Binding A Layer of Semiconductors Together	3,415,992	12-10-68	Extended Area Semiconductor Radiation Detectors And A Novel Readout Arrangement
3,396,184	08-06-68	Trialkyl-Dihalotitanium And Niobium Compounds	3,416,106	12-10-68	Broadband Microwave Waveguide Window
3,396,303	08-06-68	ARC Electrode Of Graphite With Ball Tip	3,416,274	12-17-68	Flexibly Connected Support And Skin
3,396,584	08-13-68	Space Simulation And Radiative Property Testing System and Method	**3,416,939	12-17-68	Alkali-Metal Silicate Protective Coating
3,396,920	08-13-68	Apparatus For Changing The Orientation And Velocity Of A Spinning Body Traversing A Path	3,416,975	12-17-68	Etching Of Aluminum For Bonding
**3,397,094	08-13-68	Method Of Changing The Conductivity Of Vapor Deposited Gallium Arsenide By The Introduction Of Water Into The Vapor Deposition Atmosphere	3,416,988	12-17-68	Traveling Sealer For Contoured Table
*3,397,117	08-13-68	Compact Solar Still	3,417,247	12-17-68	Radiant Energy Intensity Measurement System
3,397,318	08-13-68	Ablation Sensor	3,417,266	12-17-68	Pulse Modulator Providing Fast Rise And Fall Times
3,397,512	08-20-68	Vapor-Liquid Separator	3,417,298	12-17-68	Polarity Sensitive Circuit
3,397,932	08-20-68	Semi-Linear Ball Bearing	3,417,316	12-17-68	Sidereal Frequency Generator
3,399,299	08-27-68	Apparatus For Phase Stability Determination	3,417,321	12-17-68	Increasing Efficiency Switching-Type Regulator Circuits
3,399,574	09-03-68	Method For Leakage Testing of Tanks	3,417,332	12-17-68	Frequency Shift Keying Apparatus
3,404,348	10-01-68	Low Level Signal Limiter	3,417,399	12-17-68	Millimeter-Wave Radiometer For Radio-Astronomy
3,405,406	10-15-68	Hard Space Suit	3,417,400	12-17-68	Triaxial Antenna
3,405,887	10-15-68	Ring Wing Tension Vehicle	*3,419,329	12-31-68	Combined Optical Attitude And Altitude Indicating Instrument
3,406,336	10-15-68	RC Rate Generator For Slow Speed Measurement	3,419,363	12-31-68	Self-Lubricating Fluoride-Metal Composite Materials
*3,406,742	10-22-68	Automatic Fatigue Test Temperature Programmer	3,419,433	12-31-68	Solar Cell And Circuit Array And Process For Nullifying Magnetic Fields
			**3,419,537	12-31-68	Dicyanoacetylene Polymers
			*3,419,827	12-31-68	Indexing Microwave Switch
			3,419,964	01-07-69	Apparatus For Measuring Swelling Characteristics of Membranes
			3,420,069	01-07-69	Condenser-Separator

Patent No.	Date	Title	Patent No.	Date	Title
*3,420,223	01-07-69	Electrode For Biological Recording	3,429,529	02-25-69	Control Devices For Flexible Wing Aircraft
3,420,225	01-07-69	Balanced Bellows Spirometer	3,430,115	02-25-69	Apparatus For Ballasting High Frequency Transistors
3,420,338	01-07-69	Hermetic Sealed Vibration Damper	3,430,182	02-25-69	Electrical Feed-Through Connection For Printed Circuit Boards And Printed Cables
3,420,704	01-07-69	Depositing Semiconductor Films Utilizing A Thermal Gradient	3,430,237	02-25-69	Time Division Multiplex System
3,420,945	01-07-69	Electrode and Insulator With Shielded Dielectric Junction	3,430,909	03-04-69	Device For Handling Heavy Loads
**3,420,978	01-07-69	Pretreatment Method For Anti-Wettable Materials	3,432,730	03-11-69	Semiconductor P-N Junction Stress And Strain Sensor
3,421,004	01-07-69	Solar Optical Telescope Dome Control System	3,433,015	03-18-69	Gas Turbine Combustion Apparatus
3,421,053	01-07-69	Tumbler System To Provide Random Motion	*3,433,953	03-18-69	Compensating Radiometer
3,421,056	01-07-69	Thin Window Drifted Silicon, Charged Particle Detector	3,433,960	03-18-69	Retrodirective Optical System
3,421,105	01-07-69	Automatic Acquisition System For Phase-Lock Loop	3,433,961	03-18-69	Scanning Aspect Sensor Employing An Apertured Disc And A Commutator
*3,421,134	01-07-69	Electrical Connector	3,434,037	03-18-69	Multiple Varactor Frequency Doubler
3,421,363	01-14-69	Harness For Vertically Supporting Slender Bodies For Vibration Testing	3,434,050	03-18-69	High Impedance Measuring Apparatus
3,421,506	01-14-69	Relief Container	3,434,064	03-18-69	Amplifier Drift Tester
3,421,541	01-14-69	Relief Valve	3,434,885	03-25-69	Method Of Making Electrical Contact On Silicon Solar Cell And Resultant Product
3,421,549	01-14-69	Pneumatic System For Controlling And Actuating Pneumatic Cyclic Devices	3,435,246	03-25-69	Light Radiation Direction Indicator With A Baffle Of Two Parallel Grids
*3,421,591	01-14-69	Rock Drill For Recovering Samples	3,437,527	04-08-69	Method For Producing A Solar Cell Having An Integral Protective Covering
3,421,700	01-14-69	Electromechanical Actuator	3,437,560	04-08-69	Use Of The Enzyme Hexokinase For The Reduction Of Inherent Light Levels
3,421,768	01-14-69	Foil Seal	3,437,832	04-08-69	Ring Counter
**3,421,864	01-14-69	Multilayer Porous Ionizer	3,437,874	04-08-69	Display For Binary Characters
**3,421,948	01-14-69	Method Of Making Membranes	3,437,903	04-08-69	Protection For Energy Conversion Systems
3,422,019	01-14-69	Method For Processing Ferrite Cores	3,437,919	04-08-69	Cryogenic Apparatus For Measuring The Intensity Of Magnetic Fields
3,422,213	01-14-69	Connector Strips	3,437,935	04-08-69	Varactor High Level Mixer
3,422,278	01-14-69	Signal Generator	3,437,959	04-08-69	Helical Coaxial Resonator RF Filter
**3,422,291	01-14-69	Magnetohydrodynamic Induction Machine	3,438,044	04-08-69	Monopulse System With An Electronic Scanner
*3,422,324	01-14-69	Pressure Variable Capacitor	3,438,263	04-15-69	Fluid Sample Collector
3,422,352	01-14-69	Apparatus For Measuring Current Flow	3,439,886	04-22-69	Visual Target For Retrofire Attitude Control
**3,422,354	01-14-69	Test Fixture For Pellet-Like Electrical Elements	3,443,208	05-06-69	Optically Pumped Resonance Magnetometer For Determining Vectorial Components In A Spatial Coordinate System
3,422,390	01-14-69	Coupling Device	3,444,380	05-13-69	Electronic Background Suppression Method And Apparatus For A Field Scanning Sensor
3,422,403	01-14-69	Data Compression System	3,446,387	05-27-69	Piping Arrangement Through A Double Wall Chamber
3,422,440	01-14-69	Plural Recorder System	3,446,676	05-27-69	Solar Battery With Interconnecting Means For Plural Cells
3,423,179	01-21-69	Catalyst For Growth Of Boron Carbide Crystal Whiskers	3,446,960	05-27-69	Device For Measuring Electron-Beam Intensities And For Subjecting Materials To Electron Irradiation In An Electron Microscope
3,423,290	01-21-69	Lyophilized Reaction Mixtures	3,446,992	05-27-69	Bus Voltage Compensation Circuit For Controlling Direct Current Motor
*3,423,579	01-21-69	Electronic Divider And Multiplier Using Photocells	3,446,998	05-27-69	Bimetallic Power Controlled Actuator
3,423,608	01-21-69	Nonmagnetic Thermal Motor For A Magnetometer	3,447,015	05-27-69	Ion Thruster Cathode
3,424,966	01-28-69	Synchronous Servo Loop Control System	3,447,071	05-27-69	Probes Having Guard Ring and Primary Sensor At Same Potential To Prevent Collection Of Stray Wall Currents In Ionized Gases
3,425,131	02-04-69	Extensometer	3,447,154	05-27-69	Cooperative Doppler Radar System
3,425,486	02-04-69	Garments For Controlling The Temperature Of The Body	3,447,155	05-27-69	Ranging System
3,425,487	02-04-69	Space Suit Heat Exchanger	3,447,233	06-03-69	Bonding Thermoelectric Elements To Nonmagnetic Refractory Metal Electrodes
*3,426,230	02-04-69	Direct Radiation Cooling Of The Collector Of Linear Beam Tubes	3,447,774	06-03-69	High Pressure Air Valve
**3,426,263	02-04-69	Method And Apparatus For Battery Charge Control	3,448,346	06-03-69	Extensible Cable Support
**3,426,272	02-04-69	Device For Determining The Accuracy Of The Flare On A Flared Tube	3,448,273	06-03-69	Plurality of Photosensitive Cells On A Pyramidal Base For Planetary Trackers
3,426,746	02-11-69	Method And Apparatus For Attaching Physiological Monitoring Electrodes	3,448,290	06-03-69	Variable-Width Pulse Integrator
3,427,089	02-11-69	Ultraviolet Filter	3,448,341	06-03-69	Electrical Load Protection Device
3,427,097	02-11-69	Pneumatic Mirror Support System			
3,427,205	02-11-69	Spacecraft Battery Seals			
3,427,525	02-11-69	Regulated D.C. to D.C. Converter			
3,428,761	02-18-69	Excitation And Detection Circuitry For A Flux Responsive Magnetic Head			
3,428,812	02-18-69	Optical Spin Compensator			
3,428,910	02-18-69	Automatic Gain Control System			
3,428,919	02-18-69	Signal Multiplexer			
3,428,923	02-18-69	Broadband Choke For Antenna Structure			
3,429,477	02-25-69	Apparatus for Ejection Of An Instrument Cover			

Patent No.	Date	Title	Patent No.	Date	Title
3,447,850	06-03-69	Sealed Cabinetry	3,460,378	08-12-69	Strain Gauge Measuring Techniques
3,450,878	06-17-69	Dosimeter For High Levels of Absorbed Radiation	3,460,759	08-12-69	Combustion Chamber
3,450,842	06-17-69	Doppler Frequency Spread Correction Device For Multiplex Transmissions	3,460,379	08-12-69	Tensile Strength Testing Device
3,450,946	06-17-69	Protective Circuit of the Spark Gap Type	3,461,437	08-12-69	Digital Memory In Which the Driving Of Each Word Location Is Controlled By A Switch Core
3,452,976	07-01-69	Printed Circuit Soldering Aid	3,460,397	08-12-69	Mechanical Actuator
3,452,872	07-01-69	Shock-Layer Radiation Measurement	3,461,393	08-12-69	Cascaded Complementary Pair Broad-band Transistor Amplifiers
3,453,172	07-01-69	Bonding Graphite With Fused Silver Chloride	3,461,290	08-12-69	Conically Shaped Cavity Radiometer With a Dual Purpose Cone Winding
3,452,423	07-01-69	Segmenting Lead Telluride-Silicon Germanium Thermoelements	3,461,721	08-19-69	Flow Field Simulation
3,458,313	07-29-69	High Resolution Developing of Photo-sensitive Resists	3,461,855	08-19-69	Conditioning Suit
3,458,833	07-29-69	Frequency Control Network For a Current Feedback Oscillator	3,463,563	08-26-69	Swivel Support For Gas Bearings
3,458,104	07-29-69	Weld Control System Using Thermocouple Wire	3,464,049	08-26-69	Load Cell Protection Device
3,458,162	07-29-69	Control Devices for Flexible Wing Aircraft	3,463,939	08-26-69	Pulsed Differential Comparator Circuit
3,456,112	07-15-69	Temperature Sensitive Capacitor Device	3,464,051	08-26-69	Electrical Spot Terminal Assembly
3,456,193	07-15-69	Phase Quadrature-Plural Channel Data Transmission System	3,464,012	08-26-69	Automatic Signal Range Selector For Metering Devices
3,458,702	07-29-69	Telespectrograph	3,463,001	08-26-69	Thrust Dynamometer
3,458,651	07-29-69	Television Simulation For Aircraft and Space Flight	3,464,016	08-26-69	Demodulation System
3,458,726	07-29-69	Power Control Circuit	3,463,673	08-26-69	Electrochemical Coulometer and Method of Forming
3,453,462	07-01-69	Slug Flow Magnetohydrodynamic Generator	3,464,018	08-26-69	Digitally Controlled Frequency Synthesizer
3,453,546	07-01-69	Telemeter Adaptable for Implanting In An Animal	3,464,652	09-02-69	Control Devices For Flexible Wing Aircraft
**3,454,410	07-08-69	Alkali-Metal Silicate Protective Coating	3,466,243	09-09-69	Alloys for Bearings
3,455,171	07-15-69	Inertial Reference Apparatus	3,465,482	09-09-69	Spacecraft Radiator Cover
3,456,201	07-15-69	System For Monitoring Signal Amplitude Ranges	3,466,198	09-09-69	Solar Cell Matrix
3,458,851	07-29-69	Electrical Connector Pin With Wiping Action	3,466,085	09-09-69	Articulated Multiple Couch Assembly
3,458,217	07-29-69	Tubular Coupling Having Low Profile Band Segments With Means for Preventing Relative Rotation	3,466,459	09-09-69	Current Steering Switch
3,455,121	07-15-69	Water Separating System	3,466,570	09-09-69	Inverter With Means For Base Current Shaping For Sweeping Charge Carriers From Base Region
*3,459,391	08-05-69	Interconnection of Solar Cells	3,465,986	09-09-69	Satellite Despin Device
3,460,995	08-12-69	Method and Device for Determining Battery State of Charge	3,466,484	09-09-69	Ionization-Vacuum Gauge With All But The End of the Ion-collector Shielded
3,460,381	08-12-69	Balance Torquemeter	3,466,424	09-09-69	Evaporant Source for Vapor Deposition
3,460,781	08-12-69	Tape Recorder	3,466,052	09-09-69	Foil Seal
3,460,784	08-12-69	Control Devices for Flexible Wing Aircraft	3,465,567	09-09-69	Method of Making Tubes
			3,465,569	09-09-69	Low Temperature Flexure Fatigue Cryostat
			3,465,747	09-09-69	Ballistocardiograph
			3,466,418	09-09-69	Determination of Spot Weld Quality
			3,466,560	09-09-69	Stable Amplifier Having A Stable Quiescent Point